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RDTE PROJECT NO 1G564605D410

USATECOM PROJECT NO 1-7-2625-34

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*see Mr. inside*

STATEMENT OF TEST

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(see form 1473)

SERVICE TEST OF

RECOVERY VEHICLE, FULL-TRACKED:

LIGHT ARMORED (M113A1), XM806E1

1 COPY  
100 COPIES

FINAL REPORT

BY

LT D. G. BARNEBY

OCT 6 1969

AND

SP5 J. L. NEUMANN  
SCIENTIFIC AND ENGINEERING

31 JULY 1969

**US ARMY**

**ARMOR & ENGINEER BOARD**

**FORT KNOX, KENTUCKY**

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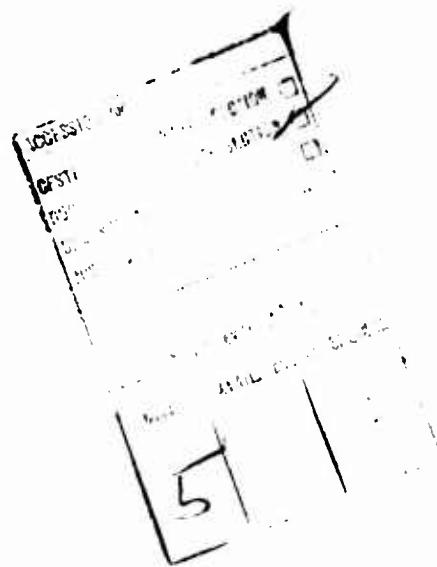
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DEPARTMENT OF THE ARMY  
HEADQUARTERS, U S ARMY TEST AND EVALUATION COMMAND  
ABERDEEN PROVING GROUND, MARYLAND 21005

AMSTE-BB

23 SEP 1969

SUBJECT: Report of Engineering and Service Tests of Recovery Vehicle,  
Full-Tracked, Light Armored (M113A1), XM806E1, USATECOM  
Project Nos. 1-VC-019-113-002/-004 (Formerly 1-7-2625-09/-34)

Commanding General  
U. S. Army Materiel Command  
ATTN: AMCRD-GV  
Washington, D. C. 20315

1. References.

- a. ENSURE requirements 56 and 134.
- b. RDT&E Project No. 1G564605D410

2. Approval Statement. Subject report is approved except as stated herein.

3. Background of Test.

a. ENSURE 56 describes the requirement for a recovery vehicle kit for the M113 armored personnel carrier. An auxiliary crane was also proposed as an accessory item. The vehicle was designated the XM806 and subjected to a military potential test. ENSURE 56 was subsequently expanded (ENSURE 134) to include the installation of the vehicle recovery kit on the M113A1. The nomenclature of Recovery Vehicle, Full-Tracked, Light Armored (M113A1), XM806E1, was assigned to this vehicle. The XM806E1 is designed for the recovery of disabled vehicles comparable in weight to the M113A1.

b. Test items include the vehicle recovery kit and an auxiliary crane adapted to the M113A1 armored personnel carrier.

(1) The vehicle recovery kit mounted in the personnel compartment, consists of components and support member for a hydraulically driven, 2-speed, 20,000 pound single line pull winch; a self-aligning fairleader with a cable tensioner; manually operated spades hinged to the rear of the vehicle; protective guards; recovery tools and equipment; and storage facilities. The winch can be operated with the ramp opened or closed.

AMSTE-BB

23 SEP 1969

SUBJECT: Report of Engineering and Service Tests of Recovery Vehicle,  
Full-Tracked, Light Armored (M113A1), XM806El, USATECOM  
Project Nos. 1-VC-019-113-002/-004 (Formerly 1-7-2625-09/-34)

(2) The auxiliary swivel mounted crane is bolted to the top of the hull, may be rotated 360°, and has a capacity of 3000 pounds. A manually pumped hydraulic cylinder, located on the side of the crane, operates the crane. A hinged base permits the crane to be lowered to a horizontal position against the top deck when not in use.

c. The objective of the test was to determine the suitability for US Army use of the vehicle recovery kit and auxiliary crane when installed on the M113A1.

d. Specific requirements or specifications for the XM806El were not established. Applicable portions of the Military Specifications for the M113A1 Armored Personnel Carrier and the Purchase Description for the XM806El were used for the evaluation. Tests were not conducted on the XM806El in those areas where there was no design change from the basic M113A1 and where the addition of the recovery kit or auxiliary crane would not have any effect on the test results.

e. The engineering test, conducted at Aberdeen Proving Ground, Maryland, included 4035 vehicle miles, 100.9 winch hours and 12 crane hours. The service test, conducted by the Armor and Engineer Board, Fort Knox, Kentucky, included 4001 vehicle miles, 100 winch hours and 12 crane hours.

4. Test Results.

a. The addition of the recovery equipment did not adversely affect the performance, handling or amphibious capabilities of the standard M113A1. Of the four deficiencies and 66 shortcomings initially reported, three deficiencies and 48 shortcomings involved the vehicle recovery kit or auxiliary crane. The remainder were failures of the basic vehicle (M113A1) which were not attributed to the addition of the recovery kit or auxiliary crane. Of the three deficiencies involving the vehicle recovery kit or auxiliary crane, one was corrected during the test and one is reclassified as a shortcoming by this headquarters. The three deficiencies, 49 shortcomings, plus the corrected deficiency are noted in succeeding paragraphs and inclosures.

AMSTE-BB

8 3 SEP 1969

SUBJECT: Report of Engineering and Service Tests of Recovery Vehicle,  
Full-Tracked, Light Armored (M113A1), XM806E1, USATECOM  
Project Nos. 1-VC-019-113-002/-004 (Formerly 1-7-2625-09/-34)

b. Reported deficiencies:

(1) The cooling fan drive belt rubbed and wore through the winch hydraulic system pickup hose after 1900 miles of operation on the Armor and Engineer Board vehicle. This is the remaining deficiency of the recovery kit and auxiliary crane.

(2) The winch stage three carrier planetary spur gear failed. This is reclassified as a shortcoming because the winch is a standard item furnished by the government and the failure was attributed to a material weakness. The failure occurred after 59.8 hours of a total of 102 hours of operation and is considered an isolated incident.

(3) The engine oil pan cracked on the same vehicle on two occasions. This failure is reclassified to an information only item as it is not chargeable to the recovery kit or auxiliary crane but rather to the basic M113A1 vehicle which was not undergoing test.

c. Shortcomings: 49. A listing of shortcomings is contained in Appendix II of the Armor and Engineer Board report (attached as inclosure 1) and in Appendix IV of the Aberdeen Proving Ground report (attached as inclosure 2). A list of shortcomings that were failures of the basic vehicle (M113A1), which were not attributed to the installation of the recovery kit or auxiliary crane, is attached as inclosure 3. The most significant shortcoming, which affects crew safety, is that the side spades, in the travel position, create a weapon firing and sighting restriction of approximately 10 degrees in azimuth at two locations. In addition the gun must be elevated approximately 1.5 degrees above the horizontal firing line to avoid the spades.

d. Corrected deficiency. The standard M113A1 towing pintle failed on four occasions at 39, 59, 247, and 697 miles during the 1000 mile towing test. This failure was corrected by installation of a larger tow pintle (M548 type) which was subjected to a 1000 mile towing test on each vehicle without incident.

5. Comments.

a. Steering control was hazardous when descending a 30% longitudinal slope with a loaded M113A1 in tow. Although the test vehicle met the braking requirements of the Purchase Description, the brakes

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23 SEP 1969

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would not hold in a descending attitude on the 30% slope with a loaded M113A1 in tow. Stopping distance with a vehicle in tow was twice that, for the same road speed and conditions, of the basic vehicle with no towed load.

b. In an ambient temperature of +120°F, only a 200 foot cable-length recovery at 50% of maximum rated load could be completed before the hydraulic fluid reached the maximum operating limit. However, 50% of maximum rated load is considered representative of line pulls expected to be experienced in the field.

c. The medium duty tow bar was not compatible with the tow connections on the 1/4 ton, 3/4 ton and 2 1/2 ton trucks. While this was not specifically required, it is highly desirable that the modification be made.

6. Conclusions. The vehicle recovery kit and auxiliary crane will be suitable for army use to meet the ENSURE requirement when the one deficiency and as many of the shortcomings pertaining to it as practicable are corrected.

7. Recommendations.

a. Although a warning is included in the vehicle publications, vehicle data plates and warnings in the operator's manual should also be provided to warn the vehicle crew of definite restrictions on speed in MPH during towing operations, precautions when descending slopes in excess of 20%, and restrictions in sighting and firing the weapon.

b. Winch quality control be improved.

FOR THE COMMANDER:

*Raymond E Johnson*  
Col GS USA  
*for:* WILLIAM H. HUBBARD  
Colonel, GS  
Deputy Chief of Staff

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### SHORTCOMINGS

The following shortcomings are not related to the vehicle recovery kit or auxiliary crane:

a. Reference Appendix II, Final Report of Service Test of Recovery Vehicle Full-Tracked, Light Armored (M113A1), XM806E1, USATECOM Project No. 1-VC-019-113-004 (formerly 1-7-2625-34), US Army Armor and Engineer Board dated 31 July 1969.

- (1) Par 2.1. The seals on four left side road wheels leaked.
- (2) Par 2.4. Inspection windows in the road wheel access hubs were pushed in allowing oil to leak around O-ring seal.
- (3) Par 2.5. The track block outer section broke at both web sections.
- (4) Par 2.6. Oil leaked at the return line elbow from the oil cooler to the crankcase.
- (5) Par 2.8. The shock absorber mounting pins on the right front and right rear road wheel support assembly wore out.
- (6) Par 2.9. Right rear idler wheels bent.
- (7) Par 2.10. The wear plates on the right and left rear road wheels wore out.
- (8) Par 2.13. The final drive outer seal was leaking and the outer bearing inner race was chipped.
- (9) Par 2.14. Left front torsion bar broke on two occasions.
- (10) Par 2.15. Oil leaked around the rocker arm cover gasket.

b. Reference Appendix IV, Final Report of Engineering Test of Recovery Vehicle, Full-Tracked, Light Armored (M113A1), XM806E1, USATECOM Project No. 1-VC-019-113-002 (formerly 1-7-2625-09), Aberdeen Proving Ground, dated August 1968.

- (1) Page IV-7. Cooling fan drive belts failed.
- (2) Page IV-7. Right number one torsion bar failed.

(3) Page IV-7. Three shock absorbers replaced because of damage or leakage.

(4) Page IV-7. Drive sprocket teeth worn.

(5) Page IV-7. Excessive back lash between generator drive pulley and shaft.

(6) Page IV-7. All rubber worn from roadwheel.

(7) Page IV-8. Dirt on bearing surface allowed roadwheel housing seals to leak.

(8) Page IV-9. Right headlight beams burnt out and lens cracked.

RDTE PROJECT NO 1G564605D410  
USATECOM PROJECT NO 1-7-2625-34

SERVICE TEST OF  
RECOVERY VEHICLE, FULL-TRACKED:  
LIGHT ARMORED (M113A1), XM806E1

TEST REPORT

BY

LT D. G. BARNEBY

AND

SP5 J. L. NEUMANN  
SCIENTIFIC AND ENGINEERING

31 JULY 1969

US ARMY ARMOR AND ENGINEER BOARD  
Fort Knox, Kentucky

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## ABSTRACT

The Service Test of the Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1, was conducted by the Maintenance and Logistics Division of the US Army Armor and Engineer Board from 16 December 1968 to 16 June 1969 at Fort Knox, Kentucky. The test objective was to determine if the test item is suitable for US Army use. Testing was conducted on one test item for a total of 4,001.2 miles and 100 hours of winch operation and 12 hours of crane operation. Testing was under actual field conditions on missions which typify normal operational use of the equipment by troops in the field. The maintenance ratio for the test item was 0.0815 hour of active maintenance time per mile of vehicle operation. Deficiencies occurred when the winch hydraulic system pickup hose rubbed against the cooling fan drive belt and the engine oil pan cracked on both the original and replacement engines. Based on 4,001.2 miles of operation and 17 equipment failures, the MTBF was 235.3 miles. The total active maintenance time to repair failures was 133.2 man-hours and 46.5 clock-hours giving a MTTR of 7.78 man-hours and 2.73 clock-hours. It was concluded that the Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1 is unsuitable for US Army use pending correction of the winch hydraulic system pickup hose deficiency. USAARENBD recommended that the cited deficiency be corrected, the engine oil pan deficiency be investigated, and as many as feasible of the shortcomings listed in appendix II be corrected.

FOREWORD

The Test Branch of the Maintenance and Logistics Division, United States Army Armor and Engineer Board, was responsible for preparing the test plan, test execution, and preparing the test report. This project was conducted under the authority contained in reference 1, appendix IV. This item was developed under RDTE Project No 1G564605D410.

## SECTION 1. INTRODUCTION

### 1.1 BACKGROUND

#### 1.1.1

ENSURE 56 describes the requirement for a recovery vehicle kit for the M113 armored personnel carrier. An auxiliary crane was also proposed as an accessory item. ENSURE 56 was subsequently expanded (ENSURE 134) to include the installation of the recovery vehicle kit on the M113A1. Although military potential tests have been conducted on the M113 (gas) version of the recovery kit and crane, engineering and service tests of the M113A1 (diesel) version are required, as type-classification of the diesel version is currently planned.

#### 1.1.2

Reference 2, appendix IV, provided the approved (by AMCTC action) nomenclature for the test item as Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1.

### 1.2 DESCRIPTION OF MATERIEL

#### 1.2.1

The test item is a Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1, equipped with a recovery kit (winch) and crane. The vehicle recovery kit (winch) consists of components and support members for a hydraulically-driven winch, self-aligning fair lead assembly with cable tensioner, guards, manually operated spades, recovery tools and equipment, and stowage facilities. For a listing of the major differences between the M113 and M113A1 (XM806E1) versions of the recovery kit and crane, see part 2, appendix I.

#### 1.2.2

The auxiliary crane, mounted on the top left, can be rotated a full 360-degree arc. The extensible arm has two positions for varying loads and flexibility of use. A manually-pumped hydraulic cylinder currently operates the crane.

#### 1.2.3

The US Army Armor and Engineer Board received one test item (Serial No C-3914) on 16 December 1968, for test and evaluation. For descriptive photographs see page I-2, appendix I.

### 1.3 TEST OBJECTIVE

To determine if the test item is suitable for US Army use.

### 1.4 SUMMARY OF RESULTS

Results are based on the operation of one test item from 16 December 1968 through 16 June 1969 during which time the test vehicle was operated a total of 4 001 2 miles over primary and gravel roads and cross country terrain. The recovery kit (winch) and crane were operated 100 hours and 12 hours, respectively.

#### 1.4.1 Preoperational Inspection and Physical Characteristics

The test item was in satisfactory condition for testing after replacement of a defective fuel level gage sending unit, prescribed servicing and minor adjustments. Vehicle gross weight was 24 485 pounds and curb weight was 23 885 pounds.

#### 1.4.2 Cross Country Mobility

The test item successfully negotiated typical terrain encountered in cross country operations and successfully ascended and descended dry and wet dirt slopes varying from 34 to 63 percent. No chassis performance drawbacks attributable to the recovery kit and crane were noted.

#### 1.4.3 Stowage

Stowage provisions for the crew's individual equipment were adequate and stowage space for OEM was sufficient, however stowage of the center blade assembly interfered with proper stowage of the .50 caliber tripod mount and the crosscut saw was difficult to remove from its stowage location because the hydraulic tank lines and radio antenna base limited access to the forward stowage strap.

#### 1.4.4 Recovery and Towing Operations

The test item successfully recovered from immobilized positions, 1/4 ton, 3/4 ton, 2 1/2 ton, and 5 ton trucks, and M114A1, M113A1, and M551 tracked vehicles. Towing of the same vehicles (1,000 miles for the M113A1) over paved and unpaved roads and cross-country terrain with the heavy-duty tow pintle installed, was satisfactory. One problem was encountered in that the medium duty tow bar as furnished for test was not compatible with the tow connections on the 1/4 ton, 3/4-ton, and 2 1/2-ton trucks. The test item was capable of self recovery. The auxiliary crane was

capable of removing, replacing, and holding (during transport) a power package from an M113A1 armored personnel carrier. Illumination for recovery operations was adequate up to distances of 150 feet.

#### 1.4.5      Inland Waterways Operations

The test item satisfactorily operated in still and moving bodies of water (stream velocity - 4 miles per hour) with no apparent adverse effects on operational characteristics or maneuverability. The test item entered and exited from dry 60-percent clay slopes.

#### 1.4.6      Fuel and Oil Consumption

The fuel tank capacity was 95 gallons. Overall fuel consumption was 1.25 miles per gallon. The test item operated for 273.7 miles without refueling. Fuel and oil consumption rate was comparable to the standard M113A1 vehicle without the recovery kit.

#### 1.4.7      Human Factors Engineering

No human factors engineering problems were encountered during testing.

#### 1.4.8      Maintainability

The test item permitted access to parts for maintenance and repair and adjustment of parts with a minimum of disturbance to other components. Repair parts for the basic vehicle are common to the current Army inventory and presented no problem. Repair parts for items peculiar to the recovery kit were not furnished with the test item. Three quarterly preventive maintenance services were performed and required a total of 80.1 man-hours. The maintenance ratio for the vehicle based on 326.3 man-hours of maintenance and 4,001.2 miles of operation was 0.0815 man-hour per miles of operation and the ratio for the recovery kit (crane and winch) for 112.0 hours of operation was 0.172 man-hour per hour of operation.

#### 1.4.9      Reliability

Deficiencies occurred when the winch hydraulic system pickup hose rubbed against the cooling fan drive belt and the engine oil pan cracked on both the original and replacement engines. There were 17 equipment failures recorded during testing, requiring a total of 133.2 man-hours and 46.5 clock-hours of active maintenance time to repair, giving a MTTR of 7.8 man-hours and 2.73 clock-hours. Based on 4,001.2 miles of operation, the MTBF was 235.3 miles.

#### **1.4.10      Tools and Test Equipment**

The test item was capable of being satisfactorily maintained with organizational and direct support common tools. No special tools were required for those maintenance operations performed. One special tool (spanner wrench) listed in TM 9-2300-224-35P/3 supplement was not furnished during testing; therefore, an evaluation could not be made.

#### **1.4.11      Technical Manuscripts and Manuals**

The test item could be satisfactorily maintained with the maintenance literature supplied. The supplements to TM 9-2300-224 series manuals were, in general adequate. There were some discrepancies noted in Supplement LO 9-2300-224-12/2, TM 9-2300-224-20P/3, and TM 9-2300-224-35P/3 that require correction.

#### **1.4.12      Training**

The skills and knowledge required by MOS 63C20, General Vehicle Repairman, were adequate for operation and maintenance of the test item.

#### **1.4.13      Safety Confirmation**

The test item was safe to operate provided safety precautions in supplement to TM 9-2300-244-10/2/1, Operator's Manual for Recovery, Full Tracked, Light Armored, XM806E1, May 1969, and the interim safety release (ref 4, app IV) were adhered to.

### **1.5            CONCLUSION**

The US Army Armor and Engineer Board concludes that the Recovery Vehicle, Full Tracked Light Armored (M113A1), XM806E1, is unsuitable for US Army use pending correction of the winch hydraulic system pickup hose deficiency (app II).

### **1.6            RECOMMENDATION**

The US Army Armor and Engineer Board recommends that the cited deficiency be corrected, the engine oil pan deficiency be investigated, and as many as feasible of the shortcomings listed in appendix II be corrected.

## SECTION 2. DETAILS OF TEST

### 2.1 INTRODUCTION

#### 2.1.1

Tests were conducted by the Test Branch, Maintenance and Logistics Division of the US Army Armor and Engineer Board at Fort Knox, Kentucky, during the period 16 December 1968 through 16 June 1969, utilizing the plan of test (ref 3, app IV). Tests were conducted utilizing one Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1.

#### 2.1.2

Throughout all operational testing, the test item was used under actual field conditions on missions which typify normal operational use of the equipment by troops in the field. In all operational tests, the test item carried the equivalent of its full combat load and three-man crew. A Carrier, Personnel, Full-Tracked, M113A1 was operated concurrently during appropriate phases of the test as a comparison item.

#### 2.1.3

Testing was conducted for 100 hours of winch operation, 12 hours of crane operation, and 4,001.2 miles on the XM806E1 vehicle.

#### 2.1.4

Test operations were conducted both day and night regardless of adverse weather conditions except when such conditions would compromise test results or endanger life or property. The test item was exposed to weather at all times throughout the test period except when under shelter for maintenance.

#### 2.1.5

Emphasis was placed on evaluation of the modifications (major differences) made on the M113A1 recovery kit and crane as listed in part 2, appendix I, and maximum use of information and test results gained from the previously conducted military potential test (USATECOM Project No 1-7-2625-31) was made to minimize unnecessary duplication of work already completed.

2.1.6

Test personnel were instructed in and followed all safety precautions in pertinent documents during conduct of the test. Normal safety regulations for water operations were followed to include the wearing of life jackets by test personnel. In addition to the safety regulations specified in Chapter 4, FM 22-20, the interim safety release (ref 4, app IV) was adhered to.

2.1.7

Throughout testing, the test item was operated and maintained in accordance with the instructions contained in the appropriate technical manuals furnished during testing.

2.1.8

Prior to initiation of test operations, test personnel received appropriate familiarization instructions in operating and servicing the test materiel. Additional instruction was provided on recovery techniques as stated in FM 22-20, Vehicle Recovery Operations.

2.1.9

The test vehicle was operated and maintained by personnel qualified in Military Occupational Specialty (MOS) 63C20, General Vehicle Repairman.

2.2 PREOPERATIONAL INSPECTION, PHYSICAL CHARACTERISTICS, AND BREAK-IN OPERATIONS

2.2.1 Objectives

2.2.1.1 To insure that the test vehicle was in proper condition for test operation.

2.2.1.2 To record the physical characteristics of the test vehicle.

2.2.1.3 To assure adequate break-in of all vehicular components and to provide necessary crew familiarization.

2.2.2 Method

The test item was:

2.2.2.1 Subjected to a preoperational inspection upon receipt.

2.2.2.2 Weighed, measured, photographed, and checked for other pertinent characteristics.

2.2.2.3 Driven and the crane and recovery kit operated as required for crew familiarization.

2.2.3 Results

2.2.3.1 When the vehicle was received, the fuel level gage sending unit was defective. After replacement of the unit, prescribed servicing, and minor adjustments, the test item was in proper condition for test operation.

2.2.3.2 The vehicle serial number was C 3914, USA registration number was 12 C 27968, initial odometer reading was 170.2 miles and the hourmeter (engine) reading was 11.5 hours

2.2.3.3 The vehicle gross weight was 24,485 pounds and the curb weight was 23,885 pounds.

2.2.3.4 The physical characteristics of the test item were as follows:

Width . . . . .	105-3/4 inches
Reducible to . . . . .	100 inches
Height . . . . .	96 inches
Reducible to . . . . .	79-1/2 inches
Length . . . . .	208-3/4 inches
Reducible to . . . . .	195 inches
Ground Clearance . . . . .	16-1/8 inches

2.2.3.5 In addition to the basic issue items listed in the supplement to TM 9-2300-224-10/2/1, tools and equipment peculiar to the XM806E1 were received. For a listing of these items, see part 3, appendix I.

2.2.3.6 For descriptive photographs, see pages I-2 and I-3, appendix I.

2.2.4 Analysis

Not applicable.

2.3       CROSS-COUNTRY MOBILITY

2.3.1      Objectives

2.3.1.1     To determine the cross-country mobility characteristics of the test vehicle.

2.3.1.2     To determine the effects of the vehicle recovery kit and crane on the basic chassis performance.

2.3.2      Method

2.3.2.1     The test and comparison vehicles were operated over various cross-country courses including rough, hilly, wooded terrain and open, rolling terrain under various weather and course conditions varying from dry to wet and muddy.

2.3.2.2     The ability of the test and comparison vehicles to negotiate the terrain, the time required, and the obstacles that immobilize them were noted.

2.3.3      Results

2.3.3.1     The test and comparison vehicles satisfactorily operated over rough, hilly, wooded terrain and open rolling terrain and successfully ascended and descended dry and wet dirt slopes varying from 34 to 63 percent.

2.3.3.2     No cross-country conditions were encountered that immobilized the test or comparison vehicles.

2.3.3.3     No chassis performance drawbacks attributable to the recovery kit were noted.

2.3.3.4     The times required for the test and comparison vehicles to negotiate identical cross-country courses were comparable.

2.3.4      Analysis

No noticeable restrictions on the cross-country characteristics of the test item were noted.

2.4       STOWAGE

2.4.1      Objective

To determine the adequacy of stowage provisions for all materiel carried in or on the test vehicle.

#### **2.4.2      Method**

A list of materiel to be carried on the test item, including equipment of the crew, was prepared and then the materiel was stowed on the vehicle during all performance tests. The list of stowed equipment is as follows:

- a. The basic issue items listed in the supplement to TM 9-2300-224-10/2/1.
- b. The items peculiar to the recovery kit as listed in part 3, appendix I.
- c. Crew individual equipment which consists of one waterproof bag (clothing) and one pack (personal articles) for each crew member.

#### **2.4.3      Results**

**2.4.3.1** The stowage provision for the crew's individual equipment was adequate.

**2.4.3.2** Stowage locations for all OEM were adequate except for the following:

- a. The crosscut saw is difficult to remove from its stowed location because the hydraulic tank and lines and radio antenna base limits access to the forward stowage strap. (See para 2.2, app II.)
- b. Stowage of the center blade assembly (11647104) interferes with proper stowage of the .50 caliber tripod mount; i.e., the head of the tripod cannot be strapped onto its mounting lugs when the blade assembly is in its stowed location because of the forward blade assembly attaching hook. (See para 2.3, app II.)

**2.4.3.3** No interference between stowed equipment and operation of vehicle components was noted.

#### **2.4.4      Analysis**

Not applicable.

### **2.5            RECOVERY AND TOWING OPERATIONS**

#### **2.5.1      Objectives**

**2.5.1.1** To determine the functional suitability of the test vehicle to tow and perform day and night recovery operations.

2.5.1.2 To determine the adequacy of the crane to lift repair parts.

2.5.2 Method

2.5.2.1 The recovery kit (winch) of the test vehicle was used to recover, both with ramp up and ramp down, the following vehicles from locations where self-extrication was impossible:

- a. Truck Utility 1/4-Ton, 4x4, M151
- b. Truck, Cargo 3/4-Ton, 4x4, M37
- c. Truck Cargo 2-1/2-Ton, 6x6; M35A1
- d. Truck. Cargo 5-Ton, 6x6, M54A2
- e. Carrier, Command and Reconnaissance, Armored, M114A1
- f. Carrier, Personnel, Full-Tracked, Armored, M113A1
- g. Armored Reconnaissance/Airborne Assault Vehicle, 152mm, Full-Tracked, M551.

2.5.2.2 With the test vehicle positioned for a typical recovery operation and utilizing the winch and a two-part line, the vehicles listed in paragraph 2.5.2.1 were winched up wet and dry dirt slopes varying up to 34 percent.

2.5.2.3 The test vehicle was used to tow the vehicles listed in paragraph 2.5.2.1 over paved roads, unpaved roads, and cross-country terrain which included 1,000 miles of operation while towing the M113A1 vehicle.

2.5.2.4 The auxiliary crane was used both day and night to remove the power "pack" from an M113A1, to transport the pack over a distance of 1/2 mile and to lift and transport filled 55-gallon drums.

2.5.2.5 Two self-recovery operations were accomplished during testing. One self-recovery was accomplished as a result of the vehicle becoming immobilized during cross-country operations and the second was a deliberate immobilization of the vehicle by nosing it into heavy consistency mud.

2.5.2.6 When the vehicles being recovered were in a position where they were difficult to get to; e.g., at the bottom of a deep gully, the utility cable sling was connected to the vehicle being

recovered instead of the tow bar and the winch cable in turn was connected to the cable sling. This method was used due to the lighter weight of the cable sling which made it easier for a crewman to manhandle.

2.5.2.7 Vehicle lights and installed power equipment were employed in conducting the above operations at night.

### 2.5.3 Results

2.5.3.1 The test item successfully recovered the vehicles listed in paragraph 2.5.2.1 during daylight and the comparison vehicle at night and satisfactorily assisted the tracked vehicles in negotiating wet and dry dirt slopes. The test item satisfactorily assisted the M113A1 vehicle in negotiating riverbanks. The stabilization equipment provided on the test vehicle was adequate for all the operations conducted.

2.5.3.2 During winching operations, a winch failure occurred when the internal snap ring, which secures the winch shift control lever to the shift spool, escaped from its groove. This caused the operator to lose the capability for shifting the winch. Subsequent to the above incident, the winch cable anchor nut that secures the winch cable to the chain extension unscrewed itself allowing the cable to disconnect, thus freeing the load.

2.5.3.3 Towing operations were satisfactorily conducted both day and night; however, during the 1,000 miles of operation towing the M113A1 vehicle, the tow pintle broke. (See para 3.2, app II.) The pintle was replaced with a standard pintle until a heavier tow pintle kit (MFR Part No 7760103) was supplied for installation on the vehicle. Installation of the heavier pintle required reboring of the bolt holes for the standard pintle to a larger size. After the heavier pintle was installed, no further problems with the pintle were encountered.

2.5.3.4 The medium duty tow bar (part No 19207-11660660), furnished with the test item, came with connectors that would not align with the towing eyes of the 1/4-ton, 3/4-ton, and 2-1/2-ton vehicles. Connection to these vehicles was made by using the connectors from a light-duty tow bar (FSN 4910-735-6056). The medium-duty tow bar was bent while towing track vehicles cross country.

2.5.3.5 Utilizing a boom radius of 60 inches, the auxiliary crane satisfactorily removed and replaced the power pack of the comparison vehicle. (See photo, page I-3, app I.) With the crane holding the pack, transportation from one shop area to another was accomplished. The crane also lifted and held (during transport) filled 55-gallon drums.

2.5.3.6 The two self-recoveries were satisfactorily accomplished. The first was during subfreezing weather when the vehicle broke through an ice layer over a deep hole and became immobile. A single part cable was rigged at a fleet angle of approximately 13 degrees but this proved insufficient to free the vehicle so a double part cable was rigged and the vehicle was satisfactorily winched from the hole. The second self-recovery was accomplished on a day when the ambient temperature was 50°F. The vehicle was nosed into heavy consistency mud approximately 10 inches above the top of the track shrouds so that it was immobile both forward and reverse. A single part cable was rigged at a fleet angle of approximately 2 degrees but this again proved insufficient to free the vehicle so a double part cable was rigged and the vehicle was satisfactorily winched free, however, the hydraulic fluid pressure approached maximum load release pressure.

2.5.3.7 The utility cable sling was satisfactorily substituted for the tow bar in areas where the recovered vehicle was difficult for the crewman to reach.

2.5.3.8 The communication control box (C 2298) mounted at the operator's station provided a satisfactory means for the operator to hear oral commands by use of the intercommunication system.

2.5.3.9 The single floodlight provided sufficient illumination for recovery work out to distances of 150 feet. Illumination at distances greater than 150 feet was marginal.

#### 2.5.4 Analysis

2.5.4.1 The winch and auxiliary crane are considered adequate for their designed purpose.

2.5.4.2 If it is desired that the test item be capable of towing the 1/4-ton, 3/4-ton, and 2 1/2-ton vehicles utilizing the medium-duty tow bar as provided for test, then provisions will have to be made to provide tow bar connectors that are compatible with the vehicles.

2.5.4.3 The floodlights' inability to provide sufficient illumination beyond 150 feet is not considered serious as it is felt that most recovery operations will be conducted at 150 feet or less since this is the maximum obtainable distance for a two part line.

2.5.4.4 It is felt that all XM806E1 recovery vehicles should be equipped with the heavier tow pintle kit (MFR Part No 7760103).

## 2.6 INLAND WATERWAYS OPERATIONS

### 2.6.1 Objectives

To determine:

2.6.1.1 The capability of the test vehicle to operate in inland waterways.

2.6.1.2 The slope and condition of banks that can be negotiated when entering and exiting the water.

2.6.1.3 The effects of recovery kit and crane on the operational characteristics of the test vehicle.

### 2.6.2 Method

The test and comparison vehicles were operated combat loaded in Tobacco Leaf Lake and the Ohio River prior to quarterly maintenance service.

### 2.6.3 Results

2.6.3.1 The test vehicle satisfactorily operated in the Ohio River at a stream velocity of 4 miles per hour. (See photo, page I-4, app I.) The vehicle entered the river from a gradual sandy slope at speeds up to 15 miles per hour without difficulty.

2.6.3.2 The test vehicle satisfactorily entered and exited Tobacco Leaf Lake from a dry 60-percent clay slope. (See photo, page I-4, app I.) Some traction was lost as the slope became wet; however, the vehicle negotiated the slope.

2.6.3.3 The test vehicle's in-water performance characteristics were satisfactory and no problems were encountered during water operations. No noticeable difference in performance between the test and comparison vehicles was detected.

2.6.3.4 There was no evidence of water entering lubricant housing, fuel supply, or power train, and no ill effects were reported by the crew during water operations.

2.6.3.5 Vehicle recovery kit and crane had no apparent adverse effects on the operational characteristics of the vehicle. Maneuverability in still and moving bodies of water was satisfactory.

2.6.3.6 Freeboard measurements in a still body of water for the test vehicle were as follows

	<u>Left Front (inches)</u>	<u>Left Rear (inches)</u>
a. Stationary Vehicle	11	10
b. Moving Vehicle	13	7

#### 2.6.4 Analysis

The additional weight of the recovery kit did not noticeably affect vehicle operations in inland waterways and the external components of the recovery kit did not materially affect entry or exit from the water or maneuverability of the vehicle in the water.

### 2.7 FUEL AND OIL CONSUMPTION

#### 2.7.1 Objective

To determine the fuel and oil consumption and cruising range of the test vehicle.

#### 2.7.2 Method

2.7.2.1 The test vehicle was operated with full combat load and crew to determine the:

- a. Fuel consumption on hard-surfaced roads.
- b. Fuel consumption cross country.
- c. Fuel consumption on gravel roads.
- d. Usable fuel capacity and cruising range.
- e. Oil consumption.

2.7.2.2 In addition to the above, the total fuel and oil consumed during testing and overall fuel consumption rate was determined.

#### 2.7.3 Results

2.7.3.1 Average fuel consumption rates (miles per gallon) for the test vehicle with surface conditions varying from dry to wet were as follows:

- a. Hard-Surface 2.9
- b. Gravel Road 2.7
- c. Cross Country 1.03

2.7.3.2 The total miles obtained in maximum cruising range (fuel runout) was 273.7 miles and the usable fuel capacity (based on maximum fuel replaced) was 96 gallons.

2.7.3.3 Total fuel and oil consumed (excluding oil changes) for 4,001.2 miles of testing was as follows:

- |                |                 |
|----------------|-----------------|
| a. Diesel Fuel | 3,198.3 gallons |
| b. Oil         | 104 quarts      |

NOTE: The oil consumed is above what it would normally be and is not considered a valid figure because of oil pans cracking (two occasions) and problems with the oil leaking around the rocker arm cover gasket. (See para 2.10.3.2.)

2.7.3.4 The overall fuel consumption rate was 1.25 miles per gallon.

#### 2.7.4 Analysis

The fuel consumption rate was comparable with the standard M113A1 without recovery kit.

### 2.8 HUMAN FACTORS ENGINEERING

#### 2.8.1 Objective

To determine whether the test vehicle is suitable with respect to safety and compatible with the skills, aptitudes, and limitations of personnel who will operate and service it.

#### 2.8.2 Method

Throughout all testing, observations were made with respect to, and the crew was instructed to report, difficulties experienced in operation of the test vehicle, discomforts suffered, safety hazards encountered, and areas where improvements could be made. Data pertinent to safety confirmation required by USATECOM Regulation 385-6 were recorded.

#### 2.8.3 Results

2.8.3.1 The test item was safe to operate provided safety precautions in supplement to TM 9-2300-224-10/2/1, Operator's Manual for Recovery, Full Tracked, Light Armored, XM806E1, May 1969, and the interim safety release (ref 4, app IV) were adhered to.

2.8.3.2 The test item was compatible with the skills, aptitudes, and limitations of the personnel (MOS 63C20) who operated and serviced it.

2.8.4 Analysis

Not applicable.

2.9 MAINTAINABILITY

2.9.1 Objective

To determine whether the vehicle meets maintenance and maintainability requirements.

2.9.2 Method

2.9.2.1 Crew and scheduled preventive maintenance services prescribed for the recovery kit were performed in conjunction with the services prescribed for the vehicle. All authorized organizational maintenance operations listed in the maintenance allocation chart peculiar to, or affected by, the recovery kit were checked to determine if the kit had any adverse effect on maintenance of the vehicle. A sampling of direct support maintenance operations peculiar to, or affected by, the recovery kit and crane were accomplished to the extent feasible. Particular emphasis was placed on evaluation of the modifications (major differences) listed in part 2, appendix I. All other maintenance operations were limited to repairs performed to keep the test item operational. The time required for all services and each maintenance operation was recorded. Data were obtained during the performance of daily, scheduled, and unscheduled maintenance to the maximum extent practicable. Crew and organizational maintenance was performed under field operating conditions during all prevailing weather conditions, in darkness as well as daylight. The following were noted.

a. Any increase in the time to accomplish a given maintenance operation and any decrease in the interval between routine maintenance operations as a result of extended usage.

b. Unduly difficult tasks, operations that require excessive time, and design deficiencies prejudicial to ease of maintenance.

c. Interchangeability of parts replaced.

2.9.2.2 Repair parts provided with the test item were compared with the repair parts used during the test and the list of repair parts in the pertinent manuals.

2.9.2.3 Adequacy of stowage compartments for operator/crew tools and recovery tools and equipment and on-vehicle repair parts was noted.

2.9.2.4 Active maintenance time for the test item was computed by adding the following:

a. Crew time spent in replacing parts. No time was expended assisting mechanics since the personnel used as crew for the test item during this test were qualified General Vehicle Repairmen (MOS 63C20).

b. Organizational maintenance personnel time spent in performing all scheduled and unscheduled maintenance.

c. All direct support maintenance personnel time.

2.9.2.5 The maintenance ratio for the complete XM806E1 vehicle and the recovery kit (crane and winch) was computed as follows:

a. Total active maintenance time in man-hours expended on the XM806E1 vehicle during test divided by total miles accumulated during test.

b. Total active maintenance time in man-hours expended on the recovery kit (crane and winch) during test divided by total operating hours accumulated during test.

### 2.9.3 Results

2.9.3.1 Man-hours expended on the performance of daily, scheduled, and unscheduled maintenance of the test item for 4,001.2 miles and 233.5 hours of vehicle operation were as follows (part 1-B, app III):

a. Operator daily services required an average of 0.7 man-hours per 8 hours of operation.

b. Personnel qualified in MOS 63C20, General Vehicle Repairman (used as crew for the test item during this test) expended 145.3 hours replacing parts. This time is included in the 326.3 hours of total active maintenance time shown in paragraph 2.9.3.1f.

c. Organizational Scheduled Maintenance

Quarterly Preventive Maintenance Services

	<u>Man-hours</u>
(1) XM806E1 (Vehicle)	
1st Q-Service	26.8
2d Q-Service	20.2
3d Q-Service	<u>20.9</u>
TOTAL	67.9
	<u>Man-hours</u>
(2) Recovery Kit (Crane and Winch)	
1st Q-Service	3.9
2d Q-Service	2.7
3d Q-Service	<u>5.6</u>
TOTAL	12.2

d. Organizational Unscheduled Maintenance

(1) XM806E1 (Vehicle)

<u>Component</u>	<u>Man-hours</u>
Engine	10.5
Fuel system	1.5
Cooling system	1.5
Electrical system	8.6
Differential and final drives	0.6
Track and suspension	102.1
Controls	1.5
Shock absorbers	2.5

<u>Component</u>	<u>Man-hours</u>
Fenders	1.0
Hull	0.6
Hoist	0.2
Fixed Fire Extinguisher System	<u>1.5</u>
TOTAL	132.1

(2) Recovery Kit (Crane and Winch)

<u>Component</u>	<u>Man-hours</u>
Throttle control, remote (fuel)	0.1
Winch	0.5
Hydraulic system	<u>0.5</u>
TOTAL	1.1

e. Direct Support Unscheduled Maintenance

(1) XM806E1 (Vehicle)

<u>Component</u>	<u>Man-hours</u>
Engine	104.0
Transfer	2.0
Safety devices	<u>1.0</u>
TOTAL	107.0

(2) Recovery Kit (Crane and Winch)

<u>Component</u>	<u>Man-hours</u>
Throttle control, remote (fuel)	0.5
Winch	3.5
Hydraulic system	<u>2.0</u>
TOTAL	6.0

f. Total Active Maintenance Time

	<u>Man-hours</u>
XM806E1 (Vehicle)	307.0
Recovery Kit (Crane and Winch)	<u>19.3</u>
OVERALL TOTAL	326.3

2.9.3.2 No increase in the time required to accomplish a given maintenance operation or any decrease in the interval between maintenance operations was noted as a result of extended usage.

2.9.3.3 Unduly difficult tasks that required excessive man-hours and/or were prejudicial to ease of maintenance are as follows:

a. Excessive maintenance time was required to remove the utility stowage tray because both the right and left side winch cable guards must be removed before removal of the tray can be accomplished. (See para 2.17, app II.)

b. The water and gas can brackets are mounted close to the floor and must be removed before the front and rear floor plates can be removed. (See para 2.18, app II.)

2.9.3.4 No safety hazards were encountered in those maintenance operations performed. All operations were accomplished with the skills and aptitudes of personnel in MOS 63C performing the services.

2.9.3.5 Repair parts replaced were interchangeable with like parts removed from the recovery kit, and the vehicle, and were consistent with the repair parts list in the pertinent manuals.

2.9.3.6 Repair parts usage data are contained in part 2-B, appendix III.

2.9.3.7 The stowage provisions for operator/crew tools, recovery tools and equipment, and on-vehicle repair parts were adequate.

2.9.3.8 The maintenance ratio for the XM806E1 vehicle and recovery kit (crane and winch) is as follows:

	<u>XM806E1</u>	<u>Recovery Kit</u>
Man-hours (Maintenance)	326.3	19.3
Clock-hours (Operation)	NA	112.0
Miles (Operation)	4,001.2	NA
Ratio (Man-hours/hr)	NA	0.172
Ratio (Man-hours/mile)	0.0815	NA

2.9.4      Analysis

Not applicable.

2.10        RELIABILITY

2.10.1      Objective

To assess the reliability of the test item and derive information regarding expected service life and required logistic support.

2.10.2      Method

2.10.2.1 After completion of other tests, the test vehicle was continued in operation until the total mileage accumulated during the entire project exceeded 4,000. The mileage accumulated consisted of approximately 30 percent primary (highway) road, 40 percent secondary road, and 30 percent cross country. The winch was operated a total of 100 hours and the crane was operated 12 hours.

2.10.2.2 A record of all failures was maintained throughout the test.

2.10.2.3 A record of active maintenance time in man-hours and clock-hours to repair failures by maintenance level was maintained throughout the test.

2.10.2.4 The Mean Time Between Failures (MTBF) was computed by dividing the total test miles for the test item by the total number of failures for the test item. No simultaneous related failures were recorded.

2.10.2.5 The Mean Time To Repair (MTTR) for the test item was computed by dividing the total active maintenance time both in man-hours and clock-hours required to correct failures on the test vehicle by the total number of failures recorded for the test vehicle.

2.10.2.6 A record of repair parts used throughout the test was maintained.

2.10.3      Results

2.10.3.1 Test mileage and hours of operation (recovery kit) were accumulated as follows:

	<u>Miles</u>
Highway	1,192 9
Secondary Road	1,603 8
Cross-Country	<u>1,204 5</u>
<b>TOTAL</b>	<b>4,001 .2</b>

Clock-hours

Winch	100.0
Crane	<u>12.0</u>
<b>Total for Recovery Kit</b>	<b>112 0</b>

2.10.3.2 The following equipment failures occurred during testing:

- a. The retaining ring (snap type) for the winch shift rod spool bearings was mutilated and escaped from its groove. This caused the operator to lose the capability for shifting the winch. A replacement snap ring was installed and there was no recurrence.
- b. The ramp hydraulic cylinder seal retaining nut worked loose allowing the hydraulic oil to leak, thus preventing the cylinder from raising the ramp.
- c. During cross-country operation, the seals on four left road wheels developed leaks. The seals and the bearings were replaced. (See para 2.1, app II.)
- d. The voltage regulator failed due to a short between the case and the mount, subsequently causing the generator to fail. Both items were replaced.
- e. The original engine was replaced due to an oil leak that could not be immediately located. Subsequent inspection revealed a cracked oil pan. (See para 1.1, app II.)
- f. The neutral starter switch had an open circuit.
- g. The oil pressure sending switch became inoperative.
- h. The idler wheel seal leaked
- i. The road wheel hub seals leaked.

- j. The four welds securing the winch control valve bracket to the vehicle ceiling broke. (See para 2.12, app II.)
  - k. The left front torsion bar broke on two occasions. (See para 2.14, app II.)
  - m. The left track tension adjuster broke.
  - n. The fuel level sending unit was defective upon receipt of the vehicle. (See para 2.2.3.1.)
  - o. The idler arm was bent during cross-country operation.
  - p. The water pump belt broke.
  - q. The oil pan cracked in the replacement engine. The crack was repaired by welding. (See para 1.1, app II.)
- 2.10.3.3 The following additional malfunctions (not classified as failures) occurred during the test period:
- a. Contacts pulled out of the plug shell assembly in the wiring harness between the generator and rectifier, resulting in incapacitation of the rectifier, generator, and voltage regulator.
  - b. The cooling fan drive belt was rubbing and wearing through the winch hydraulic system pickup hose. (See para 1.2, app II.)
  - c. The inspection windows in the road wheel hub access plates were pushed in allowing oil to leak around the O-ring seal. (See para 2.4, app II.)
  - d. The track block outer section broke at both web sections. (See para 2.5, app II.)
  - e. Oil leaked at the return line elbow from the oil cooler to the crankcase. (See para 2.6, app II.)
  - f. The guide roller shaft retaining bolt in the fair leader assembly vibrated out. (See para 2.7, app II.)
  - g. The shock absorber mounting pins on the right front and right rear road wheel support assembly wore out. (See para 2.8, app II.)
  - h. Right rear idler wheels bent. (See para 2.9, app II.)

- i. The wear plates on the right and left rear road wheels wore out (See para 2.10, app II.)
- j. The remote throttle control handle broke. (See para 2.11, app II.)
- k. The final drive outer seal was leaking and the outer bearing inner race was chipped. (See para 2.13, app II.)
- m. Oil leaked around the rocker arm cover gaskets. (See para 2.15, app II.)
- n. The spade retainer hook broke on three occasions. (See para 2.16, app II.)
- o. The winch cable anchor nut that secures the winch cable to the chain extension unscrewed itself

2.10.3.4 Based on 17 total failures for the XM806E1 vehicle, the MTBF for the vehicle was 235 3 miles

2.10.3.5 The total active maintenance time to repair failures on the XM806E1 vehicle was 133 2 man-hours and 46 5 clock-hours, giving an MTTR of 7 8 man-hours and 2 73 clock-hours.

#### 2.10.4 Analysis

Not applicable

### 2.11 TOOLS AND TEST EQUIPMENT

#### 2.11.1 Objective

To determine whether appropriate common and special tools and test equipment are suitable for the intended purpose and maintenance level.

#### 2.11.2 Method

Adequacy of crew maintenance tools, organizational maintenance tools, and field maintenance tools was checked. Observations were made throughout testing to determine if special tools or test equipment were required.

#### 2.11.3 Results

2.11.3.1 Basic issue items were adequate.

2.11.3.2 Crew, organizational, and field maintenance common tools and test equipment were adequate for the maintenance operations performed.

2.11.3.3 No special tools and test equipment were furnished for organizational maintenance support of the test item and none were required for those maintenance operations performed.

2.11.3.4 A spanner wrench (FSN 5120-733-8982) illustrated in figure 21, page 36 and listed on page 37 of TM 9-2300-224-35P/3 Supplement, required by field maintenance for support of the test item was not furnished (See para 2.19, app II.)

#### 2.11.4 Analysis

The mandatory provision of AR 750-6, pertaining to the evaluation of special tools cannot be complied with until the spanner wrench mentioned in paragraph 2.11.3.4 is furnished for evaluation.

### 2.12 TECHNICAL MANUSCRIPTS AND MANUALS

#### 2.12.1 Objective

To determine whether the equipment publications are adequate for the intended maintenance level.

#### 2.12.2 Method

2.12.2.1 The maintenance package furnished with the test item did not contain all the equipment publications required to support the test item. (See para 3.1, app II.) The equipment publications, supplements to basic vehicle technical manuals, were furnished at various intervals throughout the test period. Publications furnished were evaluated for accuracy and adequacy. For a list of all equipment publications furnished for the test item and the dates publications were received, see part 3-B, appendix III.

2.12.2.2 The equipment serviceability criteria for the test item were not received, therefore, an evaluation could not be made.

2.12.2.3 The need for an adequacy of special training requirements was analyzed.

#### 2.12.3 Results

2.12.3.1 The following manuals were evaluated and were considered adequate: (See part 3-B, app III.)

Supplement to: TM 9-2300-224-10/2/1, dated 17 Sep 64  
w Changes 1 through 5, Nov 68.

Supplement to TM 9-2300-224-10, dated 7 Nov 61, w  
Changes 1, 3, 5, 6, and 9, Apr 69

Supplement to TM 9-2300-224-10/2/1, dated 17 Sep 64,  
w Changes 1 through 6, May 69

Supplement to TM 9-2300-224-20/2/1, dated 16 Nov 64,  
w Changes 1 through 4, Nov 68

Supplement to TM 9-2300-224-20/2/1, dated 16 Nov 64,  
w Changes 1 through 4, May 69

Supplement to TM 9-2300-224-34/3, dated Jun 65, w  
Changes 1 through 3, 15 Apr 69

Supplement to TM 9-2300-224-34/3, dated Jun 65, w  
Changes 1 through 3, 1 May 69

2.12.3.2 The following documents were received; however, evaluation was not completed due to their being superseded by up-dated editions before the evaluation could be completed: (See part 3-B, app III.)

LO 9-2300-224-12/2 Supplement Lubrication Order, 15 Nov 68.

LO 9-2300-224-12 Supplement Lubrication Order, 15 May 69.

Supplement to TM 9-2300-224-20, dated 15 Dec 61, with  
Changes 1, 2, 3, 5, 8, 10, and 11, Apr 69.

TM 9-2300-224-20P/3 Supplement, XM806, undated.

TM 9-2300-224-35P/3 Supplement, XM806, undated.

2.12.3.3 The following documents were furnished during testing, were evaluated, and were considered adequate but contain discrepancies that require correction (See part 3-B, app III.) Comments are summarized below:

a. Supplement to LO 9-2300-224-12/2 Lubrication Order for Recovery Vehicle, Full Tracked, Light Armored, XM806E1, 15 June 1969. (See para 2.20, app II )

(1) The paper card lubrication order is not durable and loses its legibility after continuous use around contaminates; e.g., grease, oil, water, etc

(2) There are four weekly and one daily lubrication intervals that are considered to be too frequent.

b. TM 9-2300-224-20P/3 Supplement to Organizational Maintenance Repair Parts and Special Tools List for Recovery Vehicle, Full Tracked, Light Armored, XM806E1 (2350-800-6140) (undated). (See para 2.21, app II.)

(1) Throughout the manual, numerous repair parts are listed without Federal Stock Numbers.

(2) The terminology used to identify some repair parts and/or components in the alphabetical index is not consistent with the description of specific parts throughout the manual.

c. TM 9-2300-224-35P/3 Supplement to Direct and General Support, and Depot Maintenance Repair Parts and Special Tools List for Recovery Vehicle, Full Tracked, Light Armored, XM806E1 (2350-800-6104) (undated). (See para 2.22, app II.) Throughout the manual many repair parts are listed without Federal Stock Numbers.

2.12.3.4 No special training was required in order to adequately maintain the test item.

#### 2.12.4 Analysis

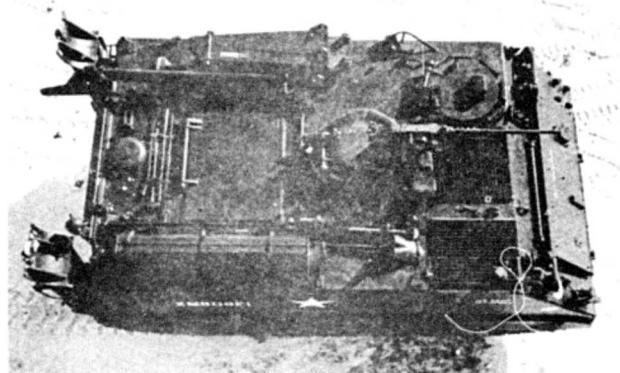
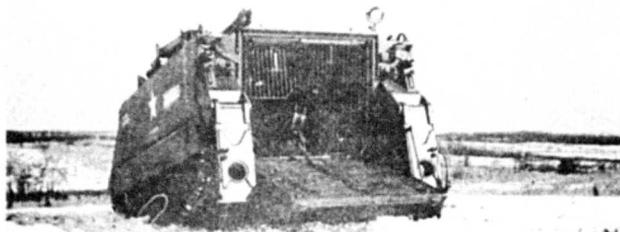
2.12.4.1 The supplements to LO 9-2300-224-12/2, TM 9-2300-224-20P/3 and TM 9-2300-224-35P/3 contain discrepancies that require correction.

2.12.4.2 It is felt that the four weekly and one daily lubrication intervals mentioned in paragraph 2.12.3.3a(2) above, would be better if changed to a quarterly or "as required" interval.

APPENDIX I. TEST DATA

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PART I. PHOTOGRAPHS

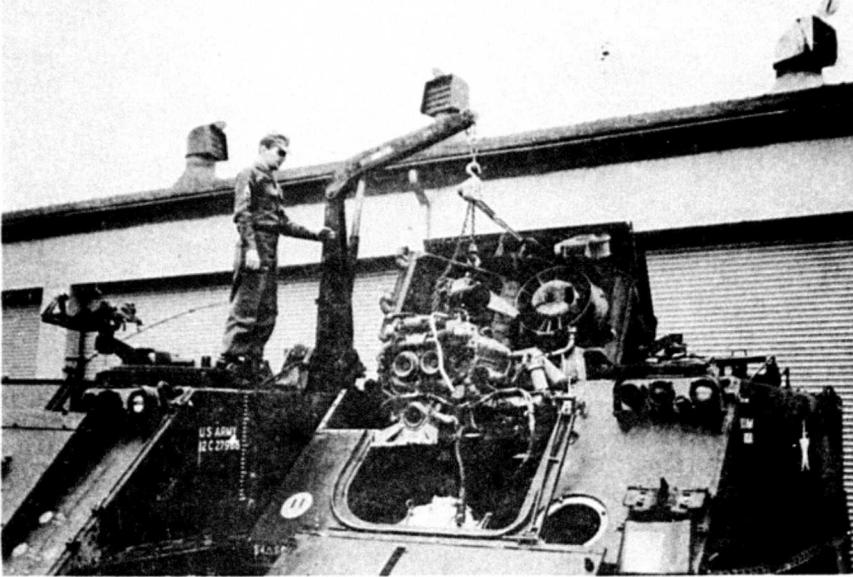


US ARMY ARMOR AND ENGINEER BOARD USATECOM PROJ NO 1-7-2625-34  
FORT KNOX, KY PHOTO NO 2-147-16D AND 2-147-16I

RECOVERY VEHICLE, FULL-TRACKED:  
LIGHT ARMORED (M113AI), XM806E1

UPPER: VEHICLE POSITIONED FOR  
RECOVERY OPERATION

LOWER: ELEVATED VIEW OF XM806E1



US ARMY ARMOR AND ENGINEER BOARD USATECOM PROJ NO 1-7-2625-34  
FORT KNOX, KY PHOTO NO 69-125A

RECOVERY VEHICLE, FULL-TRACKED:  
LIGHT ARMORED (M113A1), XM806E1

REMOVAL OF POWER PACKAGE FROM  
STANDARD M113A1 ARMORED PERSONNEL CARRIER



US ARMY ARMOR AND ENGINEER BOARD USATECOM PROJ NO 1-7-2625-34  
FORT KNOX, KY PHOTO NO 69-476A AND 68-451C

RECOVERY VEHICLE, FULL-TRACKED:  
LIGHT ARMORED (M113A1), XM806E1

UPPER: TEST VEHICLE SWIMMING IN OHIO RIVER

LOWER: TEST VEHICLE SWIMMING IN TOBACCO  
LEAF LAKE

Part 2. Major Differences between XM806E1 (M113A1)  
and M113 Recovery Vehicles

1. Pump drive for M113A1
2. Rerouted hydraulic lines in engine compartment
3. Revised remote throttle linkage
4. Strengthened winch rear mount
5. Revised level wind eccentric and guard
6. Added hydraulic gauge and warning light (160°F) on reservoir
7. New left side safety gate
8. Revised center spade attachments and anchor hinge
9. Stowage item arrangement (snatch blocks, crowbars, tow cable, intercom, center spade, etc.)
10. Revised crane base mounting to hull (tab locks)
11. Revised crane plumbing (portion)
12. Added tow cable
13. Revised winch operating lever

Part 3. Equipment and Tool List

<u>FSN/Part No</u>	<u>Nomenclature</u>	<u>Quantity</u>
11646861	Floodlight, Electric, 24-Volt w Cable Assembly	1 ea
11646863	Sling, Endless	2 ea
11633885	Lever, Fairleader	1 ea
5120-293-1439	Vise, Bench and Pipe Swivel Base, 4" Jaw Width, 6" Opening, 1/8" to 4" Pipe Cap	1 ea
NVAL	Hoist, Chain, Hand Operated, 1-1/2 Ton Capacity, Distance between Hooks 16" Retracted, Minimum Lift 50"	1 ea
4910-474-9135	Extension, Cable, Electric 24V, 20 Ft Lg w CPLGS (Slave)	1 ea
6230-548-0387	Cord, Extension, Light w Solid, Contact Plug and Socket, 25 Ft Lg	1 ea
9905-534-8376	Flare Kit, Reflector Type, w Flags, w Metal Box	1 ea
MS16888-4	Cutter, Bolt, Rigid Head Type, Clipper Cut Type, 9/16" Diameter Mild Steel Rod Cutting Cap, 35" to 39" Long	1 ea
5120-230-7843	Hammer, Hand, Sledge, Blacksmith's, Dbl-Faced, 20 lb 34" to 37" Long	1 ea
5120-224-1384	Bar, Pinch, Off Set and Tapered Ends, 1" Hex 36" Long	1 ea
5120-242-0762	Bar, Wrecking, Gooseneck and Pinch, w Claw, 3/4" Hex, 36" Long	1 ea
5120-224-1390	Crowbar, Pinch Point, 1-1/4" Diameter 59" to 62" Long	2 ea
5120-221-1075	Chisel, Blacksmith's, Cold, Handled, 1-1/2" Cutting Edge, 16" Handle	1 ea
5120-238-8292	Chisel, Machinist's, Cold, Hand, Long Length, 1" Cutting Edge, 24" Long	2 ea

<u>FSN/Part No</u>	<u>Nomenclature</u>	<u>Quantity</u>
MS16283-3	Jack, Hydraulic, Hand 8 Ton Capacity w/Operating Lever	1 ea
5110-754-0704	Saw, Crosscut, 1-Man, 4-1/2 Ft Blade, 5 Ft Long w/Supplementary Handle	1 ea
2540-860-2354	Case, Crosscut Saw, Cotton Duck, 63-3/4" Long	1 ea
8415-634-4658	Gloves, Leather, Gauntlet, Cable Handling	2 pr
7263793	Tow Bar Assembly, Medium Duty	1 ea
11631726	Snatch Block (10 Ton)	2 ea
5120-293-3334	Shovel, Hand, Round Point, Long, Handle Blade 9-1/2" Wide x 11-1/2" Long, Handle 46" Long	1 ea
4160990	Chain, Safety, Ramp	1 ea
5110-237-8106	Blade, Hacksaw, Hand	12 ea
5110-223-4971	Frame, Hacksaw, Hand Adjustable 8" to 12" Blade	1 ea
5120-197-9473	Punch, Blacksmith's Round, Handled, 1/4" Diameter Cutting Edge	1 ea
D11647282	Cable, Sling, Utility, Steel	1 ea
RR-C-271	Anchor Shackle, Screw Pin	2 ea

APPENDIX II. DEFICIENCIES AND SHORTCOMINGS

<u>Deficiency</u>	<u>Suggested Corrective Action</u>	<u>Remarks</u>
1.1 The engine oil pan cracked on both the original and replacement engines.	None	See EPR No KD-14, KD-14s, KD-38(2-14s), para 2.10.3.2e, and 2.10.3.2q.
1.2 The cooling fan drive belt was rubbing and wearing through the winch hydraulic system pickup hose.	Install a retaining clamp to hold the hose clear of the belt.	See EPR No KD-16, KD-16s, and para 2.10.3.3b.
2. SHORTCOMINGS	<u>Suggested Corrective Action</u>	<u>Remarks</u>
2.1 The seals on four left side road wheels leaked.	None	See EPR No KD-6 and para 2.10.3.2c.
2.2 The crosscut saw is difficult to remove from its stowage position.	None	See PR No KD-1 and para 2.4.3.2a.
2.3 Stowage of the center blade assembly interferes with proper stowage of the .50 cal machine gun tripod mount.	None	See EPR No KD-2 and para 2.4.3.2b.
2.4 Inspection windows in the road wheel access hubs were pushed in allowing oil to leak around O-ring seal.	None	See EPR No KD-3 and para 2.10.3.3c.

<u>Shortcoming</u>	<u>Suggested Corrective Action</u>	<u>Remarks</u>
2.5 The track block outer section broke at both web sections.	None	See EPR No KD-4 and para 2.10.3.3d.
2.6 Oil leaked at the return line elbow from the oil cooler to the crankcase.	None	See EPR No KD-7 and para 2.10.3.3e.
2.7 The guide roller shaft retaining bolt in the fair leader assembly vibrated out.	Substitute a longer bolt with a lock washer in place of the present one.	See EPR No KD-13 and para 2.10.3.3f.
2.8 The shock absorber mounting pins on the right front and right rear road wheel support assembly wore out.	None	See EPR No KD-40 and para 2.10.3.3g.
2.9 Right rear idler wheels bent.	None	See EPR No KD-37 and para 2.10.3.3h.
2.10 The wear plates on the right and left rear road wheels wore out.	None	See EPR No KD-27 and para 2.10.3.3i.
2.11 The remote throttle control handle broke.	None	See EPR No KD-26 and para 2.10.3.3j.
2.12 The four welds securing the winch control valve bracket to the vehicle ceiling broke.	None	See EPR No KD-23 and para 2.10.3.2j.
2.13 The final drive outer seal was leaking and the outer bearing inner race was chipped.	None	See EPR No KD-20, KD-21, and para 2.10.3.3k.

<u>Shortcoming</u>	<u>Suggested Corrective Action</u>	<u>Remarks</u>
2.14 Left front torsion bar broke on two occasions.	None	See EPR No KD-24, KD-32 (2-24), and para 2.10.3.2k.
2.15 Oil leaked around the rocker arm cover gasket.	None	See EPR No KD-17, KD-25 (2-17), and para 2.10.3.3m.
2.16 The spade retainer hook broke.	None	See EPR No KD-18, KD-33 (2-18), KD-31(3-18), and para 2.10.3.3n.
2.17 Excessive maintenance time was required to remove the utility tray.	Remove the slotted tabs on the front at the tray sides.	See EPR No KD-35 and para 2.9.3.3a.
2.18 The water can and gas can brackets are mounted close to the floor and must be removed before the front and rear plates can be removed.	Relocate brackets approximately 3 inches higher.	See EPR No KD-34 and para 2.9.3.3b.
2.19 The spanner wrench illustrated in figure 21 page 36 and listed on page 37 of TM 9-2300-224-35P/3 supplement was not furnished.	Comply with para 8b(8), AR 750-6.	See EPR No KD-36 and para 2.11.3.4.
2.20 Discrepancies in LO 9-2300-224-12/2 Supplement Lubrication Order Recovery Vehicle, Armored, XM806E1, 15 June 1969, require correction.	Corrective action submitted to US Army Tank-Automotive Command, ATTN: AMSTA-RTT-1, Warren, Michigan 48090.	See EPR No KD-1 (Pub) and para 2.12.3.3a.

<u>Shortcoming</u>	<u>Suggested Corrective Action</u>	<u>Remarks</u>
2.21 Discrepancies in TM 9-2300-224-20P/3 Supplement Organizational Maintenance Repair Parts and Special Tools List for Recovery Vehicle, Full Tracked, Light Armored, XM806E1 (2350-800-6104) undated, require correction.	Corrective action submitted to US Army Tank-Automotive Command, ATTN: AMSTA-RTT.1, Warren, Michigan 48090.	See EPR No KD-2 (Pub) and para 2.12.3.3b.
2.22 Discrepancies in TM 9-2300-224-35P/3 Supplement Direct and General Support and Depot Maintenance Repair Parts and Special Tools List for Recovery Vehicle, Full Tracked, Light Armored, XM806E1 (2350-800-6104) undated, require correction.	Corrective action submitted to US Army Tank-Automotive Command, ATTN: AMSTA-RTT.1, Warren, Michigan 48090.	See EPR No KD-3 (Pub) and para 2.12.3.3c.
3. CORRECTED DEFICIENCY AND SHORTCOMING		
<u>Deficiency/Shortcoming</u>	<u>Corrective Action</u>	<u>Remarks</u>
3.1 The maintenance package did not include the following equipment manuals:	Manuals were furnished prior to test completion.	See EPR No KD-10 and para 2.12.2.1.
a. Supplement to TM 9-2300-224-20P/3 35		
b. Supplement to TM 9-2300-224-		
c. Supplement to TM 9-2300-224-35P		

<u>Deficiency/Shortcoming</u>	<u>Corrective Action</u>	<u>Remarks</u>
3.2 The towing pintle broke.	A tow pintle kit MFR Part No 7760103, which included a heavier tow pintle was provided as a replacement for the standard pintle and proved satisfactory.	See EPR No KD-9 and para 2.5.3.3.

NOTE: Equipment Performance Reports KD-5, KD-11, KD-12 and KD-19 all originally submitted as deficiencies and EPR KD-15 originally submitted as a shortcoming have been reclassified "for information only". EPR KD 22, KD 28, KD-29, and KD-39 were submitted for information only. EPR KD-30 was erroneously submitted on the comparison vehicle. None of the above EPR are referred to in this appendix and require no action.

## APPENDIX III MAINTENANCE EVALUATION

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PART 1-A

MAINTENANCE AND RELIABILITY ANALYSIS CHART INSTRUCTION SHEET

<u>COLUMN</u>	<u>DESCRIPTION</u>
1	Group number as indicated in the Maintenance Allocation Chart. The sequence in which the maintenance operation was performed is indicated in parenthesis.
2	Component and related operations as indicated in the Maintenance Allocation Chart. Operations indicated as in Depot Category are not shown.
3	Maintenance Level, Prescribed. Category prescribed by the Maintenance Allocation Chart is indicated by the letters C, O, F, or H. C - Operator or Crew; O - Organizational; F - Direct Support; H - General Support.
4	Maintenance Level, Recommended. Category recommended by the test agency.
5	TM Instructions, Adequate. An X in this column indicates the TM instructions are considered adequate. NA indicates no instructions were deemed necessary.
6	TM Instructions, Inadequate. The test agency EPR number is indicated in this column, if the instructions are considered inadequate.
7	Active Maintenance Time. The man-hours and clock-hours of active maintenance time to the closest tenth are shown.
8	System Life. Number of hours and miles accumulated before or since this operation was performed. The sequence number for which the particular operation was last performed is shown in parenthesis. An "S" is shown in this column if the operation was performed on a sampling basis and not because of an actual failure.

<u>COLUMN</u>	<u>DESCRIPTION</u>
9	Reason performed The symbol "Unsched" is shown in this column if the operation was performed as a result of unscheduled maintenance. If the operation was performed as a result of scheduled maintenance, it is indicated by the symbol "Sched". If the operation was performed only to verify procedures as tools not as a result of breakdown, it is indicated by the symbol "Sim".
10	Remarks If an EPR was related to a maintenance operation, the EPR number is indicated. The notation "failure" indicates operations performed as a result of a failure.

MAINTENANCE AND RELIABILITY ANALYSIS CHART		PROJECT NO. 1-7-2625-34		NOMENCLATURE Light Armored Recovery Vehicle, Full-Tracked: (M113A1), /M806E1		IDENTIFICATION NO. C-3914	
GF No.	COMPONENT REPLACED OR ADJUSTED	MAINTENANCE LEVEL		MH-Man- hours CH-Clock hours		SYSTEM LIFE M-MILE MAIN LINE	
		C - OPERATOR CREW O - OFC F - DIRECT H - GENERAL	INSTRUMENTS PRESSURE LEVEL	INSTR. INSTR.	ACTIVE MAIN LINE	Maint H-HOURLY B-FOURING	REASON PERIOD
1301.2 (1)	Replaced: Hub, Idler Roadwheel	0	0	X		0.4-MH 0.4-CH	171.6-M 11.6-H
1305 (2)	Repaired: Track	C	0	X		1.0-MH 0.5-CH	171.6-M 11.6-h
2001 (3)	Repaired: Winch Control, Shift	Not Presb	F	X		2.0-MH 1.5-CH	331.8-M 20.5-H
0308 (4)	Adjusted: Control, Throttle, Remote	0	0	X		0.1-MH 0.1-CH	331.8-M 20.5-H
0601.1 (5)	Repaired: Link, Adjusting Generator	0	0	X		0.1-MH 0.1-CH	331.8-M 20.5-H
2003.2 (6)	Repaired: Cylinder, Ramp Hydraulic System	F	0	X		0.2-MH 0.2-CH	331.8-M 20.5-H
1301.2 (7)	Replaced: Bearing & Seals, Idler and Road wheel Hub	0	0	X		12.0-MH 3.0-CH	331.8-M 20.5-H
0106.3 (8)	Repaired: Cooler, Engine Oil	F	0	X		7.3-MH 3.5-CH	331.8-M 20.5-H
0602 (9)	Replaced: Regulator Generator	0	0	X		0.5-MH 0.5-CH	973.4-M 63.5-H

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MAINTENANCE AND RELIABILITY ANALYSIS CHART		PROJECT NO. 1-7-2625-34		NOMENCLATURE Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1		IDENTIFICATION NO. C-3914	
GF NO.	COMPONENT, RELATED SYSTEM	MAINTENANCE LEVEL		TIME INSTRUCTIONS		MH-Man hours CH-Clock hours ACTIVE	SYSTEM LIFE M-MILES H-HOURS MAINT LINE R-ROUTE
		PRESSR	REVM	ADJ.	W/W.E.		
0601.1 (10)	Replaced: Generator	0	0	X		0.5-MH 0.5-CH	973.4-M 63.5-H
0106 (11)	Q Service (1 st)	0	0	X		30.7-MH 15.8-CH	973.4-M 63.5-H
0607 (12)	Replaced: Lamp Unit, Headlight	0	0	X		0.2-MH 0.2-CH	1,018.5-M 67.5-H
0100.2 (13)	Replaced: Engine	F	F	X		32.0-MH 14.0-CH	1,027.5-M 68.4-H
0607 (14)	Repaired: Harness, Wiring, Generator	0	0	X		0.8-MH 0.4-CH	1,027.5-M 38.4-H
0607 (15)	Replaced: Indicator (Generator)	Not Presb	0	X		0.5-MH 0.5-CH	1,027.5-M 38.4-H
1304 (16)	Reversed: Sprockets	Not Presb	0	X		1.0-MH 1.0-CH	1,027.5-M 68.4-H
0608.1 (17)	Replaced: Switches Miscellaneous (Neutral starter)	0	0	X		2.0-MH 1.5-CH	1,027.5-M 68.4-H
0608.1 (18)	Adjusted: Switches Miscellaneous (Stop Light)	Not Presb	0	X		0.5-MH 0.5-CH	1,027.5-M 68.4-H

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USATECOM REGULATION 750-15

MAINTENANCE AND RELIABILITY ANALYSIS CHART		PROJECT NO. 1-7-2625-34		NOMENCLATURE Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1		IDENTIFICATION NO. C-3914			
GF NO.	COMPONENT AND RELATED MAINTENANCE ITEM	MAINTENANCE LEVEL		MAN-HOURS CH-CLOCK		SYSTEM LIFE M-MILES H-HOURS R-OUNDS		REASON PERFORMED	REASON REFUSED
		PRES	REMV	INSTR	AD.	INST.	MAIN		
2401 (19)	Weighed, Cylinder (Fixed Fire Extinguishers)	0	0	X			0.5-MH 0.5-CH	1,027.5-M 68.4-H	Unsched
0607 (20)	Replaced: Lamps	0	0	X			0.3-MH 0.3-CH	1,027.3-M 68.4-H	Unsched
0608.1 (21)	Replaced: Switches Miscellaneous (Oil Pressure)	0	0	X			1.0-MH 0.5-CH	1,027.5-M 63.4-H	Unsched
0607 (22)	Replaced: Lamp Unit (Headlight) Right	0	0	X			0.5-MH 0.5-CH	1,027.5-M 68.4-H	Unsched
0306.2 (24)	Repaired: Lines Hoses & Fittings, Fuel Engine	Not Presb	0	X			1.0-MH 1.5-CH	1,756.7-M 99.8-H	Unsched
01 (25)	Repaired: Engine	Not Presb	0	X			1.0-MH 1.0-CH	1,756.7-M 99.8-H	Unsched
2101 (26)	Repaired: Vane, Trim	F	F	X			1.0-MH 1.0-CH	1,789.8-M 105.4-H	Unsched
0106 (27)	Q Service (2 d)	0	0	X			22.9-MH 7.4-CH	1,911.0-M 115.7-H	Sched
1008.2 (28)	Replaced: Seal, Oil Final Drive Pinion	0	0	X			0.6-MH 0.2-CH	1,918.9-M 117.9-H	Includes 2.7-MH and 1.8-CH for the recovery kit.
									Deferred from 1,911.0-M, 115.7-H.

USATECOM REGULATION 750-15

ERF FORM 1014 1 Nov 66 (Rev)

MAINTENANCE AND RELIABILITY ANALYSIS CHART		PROJECT NO. 1-7-2625-34	NOMENCLATURE Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XMBODGE				IDENTIFICATION NO. C-3914
GF No.	COMPONENT, AM, RELATED ORIGINALLY	MAINTENANCE LEVEL		IN INSPECTION		SYSTEM LIFE H-HOURS E-FOURCS	REASON PERFORMED
		C - OPERATOR/CREW	O - O&G	P - DIRECT	H - GENERAL		
PRESS	REC'D	AD.:	INSTR.				
1803.1 (29)	Replaced: Handles and Latches	0	0	X		0.1-MH 0.1-CH	1,918.9-M 117.9-H
0607 (30)	Replaced: Lamps	0	0	X		0.1-MH 0.1-CH	1,918.9-M 117.9-H
1305 (31)	Repaired: Track	C	0	X		0.6-MH 0.3-CH	1,918.9-M 117.9-H
1401 (32)	Adjusted: Controls & Linkage (Brakes)	0	0	X		1.0-MH 0.5-CH	1,938.5-M 120.1-H
1701 (33)	Repaired: Fender (Left Rear)	F	0	X		1.0-MH 0.5-CH	1,938.5-M 120.1-H
1801 (34)	Repaired: Guard, Taillight (right)	0	0	X		0.5-MH 0.5-CH	1,938.5-M 120.1-H
1301.2 (35)	Replaced: Bearings & Seals, Idler	0	0	X		0.8-MH 0.8-CH	1,938.5-M 120.1-H
1301.2 (36)	Replaced: Bearings and Seals (Roadwheel hub)	0	0	X		0.8-MH 0.8-CH	1,938.5-M 120.1-H
1604.3 (37)	Replaced: Bumper, Rubber, Roadwheel Arm	0	0	X		0.5-MH 0.5-CH	1,938.5-M 120.1-H
0505 (38)	Adjusted: Belt Drive Engine Water Pump	0	0	X		0.2-MH 0.2-CH	1,938.5-M 120.1-H

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MAINTENANCE AND RELIABILITY ANALYSIS CHART		PROJECT NO. 1-7-2625-34		NOMENCLATURE Recovery Vehicle, Full-Tracked: Light Armored (M113A1).				IDENTIFICATION NO. C-3914	
GF NO.	COMPONENT AND RELATED OPERATING CIRCUITS	MAINTENANCE LEVEL		INSTRUCTIONS		REASON PERFORMED	REMARKS		
		PRESS	RECN	ADJ.	IMKCT				
2401 (39)	Sealed: Controls, Fire Extinguisher (portable)	0	0	X		0.5-MH 1,938.5-M 0.5-CH 120.1-H	Unsched	Left rear of vehicle.	
2401 (40)	Sealed: Controls, Fixed Fire Extinguisher	0	0	X		0.5-MH 1,938.5-M 0.5-CH 120.1-H	Unsched		
0609.2 (41)	Repaired: Light, Dome, Hull	0	0	X		0.3-MH 1,938.5-M 0.3-CH 120.1-H	Unsched		
0505 (42)	Adjusted: Belt, Drive Engine Water Pump	0	0	X		0.3-MH 1,938.5-M 0.3-CH 120.1-H	Unsched		
01 (43)	Repaired: Engine Hot Press	0	0	X		0.5-MH 1,938.5-M 0.5-CH 120.1-H (25)	Unsched	Replaced rocker arm gasket.	
0607 (44)	Replaced: Lights (High beam indicator)	0	0	X		0.3-MH 1,938.5-M 0.3-CH 120.1-H	Unsched		
1301.2 (45)	Replaced: Inner Roadwheel No 2 and 3 (Right)	0	0	X		6.0-MH 2,080.1-M 2.0-CH 128.3-H	Unsched		
2001 (46)	Repaired: Winch Control Valve Bracket	0	0	X		1.5-MH 2,269.1-M 1.5-CH 137.4-H	Unsched	Failure. See EPR No KD-23. Welded valve mounting bracket to hull.	
1301 (47)	Replaced: Bar Torsion Roadwheel Arm Left Front	0	0	X		2.0-MH 2,294.0-M 1.0-CH 139.0-H	Unsched	Failure. See EPR No KD-24.	

USATECOM REGULATION 750-15

EBF FORM 1014 1 Nov 66 (Rev)

MAINTENANCE AND RELIABILITY ANALYSIS CHART		PROJECT NO. 1-7-2625-34		NOMENCLATURE Recovery Vehicle, Full-Tracked: Light Armored (M113A1)				IDENTIFICATION NO. C-3914	
GF NO.	COMPONENT AND RELATED OPERATIONS	MAINTENANCE LEVEL C - OPERATOR/CREW O - OFFS F - DIRECT H - GENERAL		INSTRUCTIONS		NH-MAN-HOURS CH-CLOCK HOURS	SYSTEM LIFE ACTIVE HOURS MAINT TIME	REASON PERFORMED	REMARKS
		PRESR	REGM	ADJ.	IM/SEC				
01 (48)	Repaired: Engine Presb	Not Presb	0	X		1.0-MH 2,549.7-M 1.0-CH 157.3-H (43)	Unsched		See EPR No KD-25. Replaced rocker arm gasket.
1301.2 (49)	Replaced: Road Wheel Left Rear	0	0	X		2.0-MH 2,549.7-M 1.0-CH 157.3-H	Unsched		See EPR No KD-27.
0610 (50)	Replaced: Transmitter Fuel Tank	0	0	X		0.3-MH 2,549.7-M 0.3-CH 157.3-H	Unsched		See EPR No KD-28.
1304 (51)	Replaced: Sprocket, Drive	0	0	X		4.0-MH 2,549.7-M 2.0-CH 157.3-H	Unsched		See EPR No KD-28.
1304 (52)	Replaced: Cushion, Sprocket Carrier	0	0	X		2.0-MH 2,549.7-M 1.0-CH 157.3-H	Unsched		See EPR No KD-28.
1305 (53)	Repaired: Track	C	0	X		6.0-MH 2,549.7-M 3.0-CH 157.3-H	Unsched		Replace shoe assembly.
0607 (54)	Replaced: Lamp Unit Headlight	0	0	X		0.1-MH 1,531.2-M 0.1-CH 89.8-H (12)	Unsched		
0607 (55)	Replaced: Lamp Unit Headlight	0	0	X		0.1-MH 2,549.7-M 0.1-CH 157.3-H	Unsched		
0308 (56)	Repaired: Control, Throttle, Remote	Not Presb	F	NA		0.5-MH 2,596.0-M 0.5-CH 160.2-H	Unsched		See EPR No KD-26. Welded handle.

MAINTENANCE AND RELIABILITY ANALYSIS CHART		PROJECT NO. 1-7-2625-34		NOMENCLATURE Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1				IDENTIFICATION NO. C-3914	
GF NO.	COMPONENT AND RELATED OPERATIONS	MAINTENANCE LEVEL		INSTRUCTIONS		SYSTEM LIFE		REASON PERFORMED	FREQUENCY
		PRESS	REGM	ADLT	IMDG	M-HOURS H-MINUTES R-SECONDS	M-MILES H-HOURS R-SECONDS		
1301 (57)	Replaced: Bar, Torsion Roadwheel Arm Left Front	0	0	X		1.5-MH 0.5-CH	590.5-M 37.8-H (47)	Unsched	Failure. See EPR No KD-32.
1305 (58)	Repaired: Track	C	0	X		2.0-MH 4.0-CH	3,004.5-M 180.8-H	Unsched	Replaced shoe assembly.
2001 (59)	Replaced: Latches, Spade, Blade and Shields	0	0	X		0.5-MH 0.5-CH	3,004.5-M 180.8-H	Unsched	
0106 (60)	Q Service (3d)	0	0	X		26.5-MH 20.6-CH	3,004.5-M 180.8-H	Sched	Includes 5.6-MH and 3.8-CH for the recovery kit.
1301 (61)	Replaced: Roadwheel	0	0	X		6.0-MH 2.0-CH	3,442.8-M 93.5-H	Unsched	
1305 (62)	Repaired: Track	C	0	X		0.9-MH 0.3-CH	3,442.8-M 93.5-M	Unsched	Replaced shoe assembly.
1303 (63)	Replaced: Adjuster Tension Track	0	0	X		0.6-MH 0.2-CH	3,584.8-M 108.5-H	Unsched	Failure. No EPR submitted.
1305 (64)	Repaired: Track	C	0	X		6.0-MH 3.0-CH	3,609.5 211.4-H	Unsched	Replaced shoe assembly.
4305 (65)	Repaired: Winch Central Valve Bracket	Hot Presb	0	NA		2.0-MH 1.5-CH	1,340.4-M 74.(-H (46)	Unsched	Welded valve mounting bracket to hull broke from previous weld.

MAINTENANCE AND RELIABILITY ANALYSIS CHART		PROJECT NO. 1-7-2625-34		NOMENCLATURE Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XMB06E1		IDENTIFICATION NO. C-3914		
GF NO.	COMPONENT AND RELATED OPERATIONS	MAINTENANCE LEVEL		INSTRUCTIONS		MH-Man-hours CH-Closed hours ACTIVE MAIN-TIME	REASON PERFORMED	REFS
		PRESB	REGM	ADLT	INSTR.			
01 (66)	Repaired: Engine	0	0	X		0.5-MH 0.5-CH	3,609.5-M 211.4-H	Unsched
0607 (67)	Replaced: Lamps	0	0	X		0.5-MH 0.5-CH	3,609.5-M 211.4-H	Unsched
01 (68)	Repaired: Engine	0	0	X		0.5-MH 0.5-CH	3,609.5-M 211.4-H	Unsched Replaced clamp.
1401 (69)	Adjusted: Controls and Linkage (Brakes)	0	0	X		0.5-MH 0.5-CH	3,609.5-M 211.4-H (32)	Unsched
0309 (70)	Replaced: Lines, Fittings and Valves (fuel system)	0	0	X		0.5-MH 0.5-CH	3,609.5-M 211.4-H	Unsched Failure. No EPR submitted.
1303 (71)	Repaired: Arm, Idler Wheel	F	0	X		2.0-MH 1.0-CH	3,609.5-M 211.4-H	Failure. No EPR submitted. Replaced tapered roller bearing.
4301 (72)	Repaired: Hoses and Fittings, Crane and Winch	0	0	X		0.5-MH 0.5-CH	3,609.5-M 211.4-H	Unsched
1304 (73)	Reversed: Sprockets	ilot Presb	0			NA	2.0-MH 1.0-CH	3,609.5-M 211.4-H (16)
1303 (74)	Replaced: Wheel, Idler	0	0	X		1.0-MH 1.0-CH	3,609.5-M 211.4-H	Unsched

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MAINTENANCE AND RELIABILITY ANALYSIS CHART		PROJECT NO.		NOMENCLATURE				IDENTIFICATION NO.	
		1-7-2625-34		Recovery Vehicle, Full-Tracked: Light Armored (M113A1).				C-3914	
		MAINTENANCE LEVEL		SYSTEM					
		C - OPERATOR/CREW O - OFFICER F - DIRECTOR R - GENERAL		CH-CLOCK SYSTEM					
CF NO.	COMPONENT AND RELATED OPERATIONS	PRESSR	REMN	ADT:	IM. DFC:	ACTIVE HOURS	MILES	REASON PERFORMED	REMARKS
1	2	3	4	5	6	7	8	9	10
1301 (75)	Replaced: Roadwheel	0	0	X		1.0-MH 0.5-CH	3,609.5-M 211.4-H	Unsched	
1301.2 (76)	Replaced: Bearings and Seals, Idler and Roadwheel Hub	0	0	X		0.5-MH 0.5-CH	3,609.5-M 211.4-H	Unsched	Replaced gasket.
0505 (77)	Replaced: Belt, Drive Engine Water Pump	0	0	X		1.0-MH 1.0-CH	3,609.5-M 211.4-H	Unsched	Failure. No EPR submitted.
0106.6 (78)	Repaired: Pan Oil Engine	F	F	X		72.0-MH 18.0-CH	3,609.5-M 211.4-H	Unsched	Failure. See EPR No KD-38 (2-14s). Welded crack in oil pan and replaced gasket.
0820 (79)	Replaced: Mount, Transfer Gearcase	0	F	X		2.0-MH 1.0-CH	3,609.5-M 211.4-H	Unsched	
1301 (80)	Replaced: Bearings and Seals, Roadwheel	0	0	X		30.0-MH 10.0-CH	3,609.5-M 211.4-H	Unsched	
1604.1 (81)	Replaced: Absorber, Shock	0	0	X		2.0-MH 1.0-CH	3,609.5-M 211.4-H	Unsched	See EPR No KD-40.
		TOTAL ACTIVE MAINTENANCE (MIN-HOURS)				326.3			
		TOTAL ACTIVE MAINTENANCE (CLOCK-HOURS)				157.9			

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MAINTENANCE AND RELIABILITY ANALYSIS CHART		PROJECT NO. 1-7-2625-24		NONENCLATURE XN06E1		Vehicle, Full-Tracked: Light Armored (M113A1), SIMULATED		IDENTIFICATION NO. C-3914	
GF NO.	COMPONENT AND RELATED OPERATION	MAINTENANCE LEVEL		TIME INSTRUCTIONS		MH-Man- hours CH-Clock SYSTEM LIFE		REASON PERFORMED	EFFECT
		PRESS	REGM	A.U.	IMM. DUE	M-HRS. MAIN	M-MILES R-FOUNDRY		
3307	Replaced: Belt Set, Drive (hydraulic pump)	0	0	X		1.0-MH	S	Sim	
3307	Replaced: Breaker, Circuit, Utility Outlet	0	0			0.5-MH	S	Sim	
3307	Replaced: Cable, Spade Positioning	0	0			0.3-MH	S	Sim	
3307	Replaced: Cable, Winch	0	0			7.5-MH	S	Sim	
3307	Replaced: Control, Shift, Winch Ratio	0	0			1.0-MH	S	Sim	
3307	Replaced: Control, Throttle, Remote	0	0			0.3-MH	S	Sim	
3307	Replaced: Crane	0	0			1.0-MH	S	Sim	
3307	Replaced: Fair-leader	0	0			2.0-MH	S	Sim	
3307	Replaced: Filter and Element, Hydraulic Fluid	0	0			0.5-MH	S	Sim	
3307	Replaced: Floodlight	0	0			0.1-MH	S	Sim	

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MAINTENANCE AND RELIABILITY ANALYSIS CHART		PROJECT NO. 1-7-2625-34		NOMENCLATURE Recovery Vehicle, Full-Tracked: XM806E1		Light Armored (M113A1), C-3914		IDENTIFICATION NO.			
GF NO.	COMPONENT RELATED ITEM	MAINTENANCE LEVEL		TIME INSTRUCTIONS		MH. Man hours CH-Clock hours		REASON PERFORMED			
		C - OPERATOR/CREW	O - OEG	F - DIRECT	E - GENERAL	PRESR	REVN	AD.	INSTR.	M-MILES H-HOURS R-ROUTE	REGULAR
3307	Replaced: Gage, Hydraulic Pressure	0	0							0.3-MH 0.3-CH	S
3307	Replaced: Hoses and Fittings Crane and Winch	0	0							0.3-MH 0.3-CH	S
3307	Replaced: Latches, Spade, Blade and Shields	0	0							0.5-MH 0.5-CH	S
3307	Replaced: Levelwind	0	0							4.0-MH 2.0-CH	S
3307	Replaced: Light, Fluid High Tempera- ture	0	0							0.1-MH 0.1-CH	S
3307	Replaced: Linkage, Hydraulic Pump	0	0							1.0-MH 1.0-CH	S
3307	Replaced: Motor, Hydraulic Winch	0	0							3.0-MH 2.0-CH	S
3307	Replaced: Pump and Mount, Hydraulic Winch	0	0							3.0-MH 1.5-CH	S
3307	Replaced: Receptacle, Utility Outlet	0	0							0.3-MH 0.3-CH	S

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MAINTENANCE AND RELIABILITY ANALYSIS CHART		PROJECT NO. 1-7-2625-34		NOMENCLATURE Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1		IDENTIFICATION NO. L-3914	
GF NO.	COMPONENT AND RELATED OPERATIONS	MAINTENANCE LEVEL		TIME INSTRUCTIONS		REASON PERFORMED	
		PRESS	RCM	ADLT	IMMEDIATE	MH-MAN hours CH-CLOCK hours	LIFE M-MILES ACTIVE H-HOURS MAINT R-ROUND
1	E	3	4	5	6	0.5-MH 0.5-CH	S
3307	Replaced: Shields & Guards, Safety	0	0			0.5-MH 0.5-CH	Sim
3307	Replaced: Spades and Blade	0	0			1.0-MH 0.5-CH	Sim
3307	Replaced: Strainer (Filter) Hydraulic Fluid	0	0			0.5-MH 0.5-CH	Sim
3307	Replaced: Switch, Fluid High Temperature	0	0			0.5-MH 0.5-CH	Sim
	Replaced: Tank, Hydraulic Fluid	0	0			1.5-MH 0.8-CH	Sim
3307	Replaced: Tensioner, Fairleader	0	0			1.0-MH 1.0-CH	Sim
3307	Replaced: Valve, Counterbalance, Winch	0	0			1.0-MH 1.0-CH	Sim
3307	Replaced: Valve, Control, Winch	0	0			1.0-MH 1.0-CH	Sim
3307	Replaced: Winch	0	0			4.0-MH 2.0-CH	Sim

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PART 2-A

PARTS ANALYSIS CHART INSTRUCTION SHEET

**GENERAL:** Parts are listed on charts by functional groups and in numerical order within groups.

<u>COLUMN</u>	<u>DESCRIPTION</u>
1	Group Number, Cross Reference. Parts usage by maintenance operation is indicated by a cross reference to the group number and sequence number from Column 1 of the Maintenance and Reliability Analysis Chart.
2	Federal Stock Number, Technical Service Part Number, Manufacturers' Part Number, or Drawing Number. The number of parts used is shown in parenthesis.
3	Noun Nomenclature. As listed in the parts manual (-20P).
4	Maintenance Level, Prescribed. Maintenance level as prescribed by the parts list under review: C - Operator/Crew; O - Organizational; F - Direct Support; H - General Support.
5	Maintenance Level, Recommended. Maintenance level recommended by the test agency.
6	Part Life. The number of miles and hours accumulated before or since this part was replaced.
7	Reason Used. The symbol "Unsched" is shown in this column if the part was used as a result of unscheduled maintenance. If the part used was the result of scheduled maintenance, the symbol "Sched" is used. If the part was consumed to verify procedures or tools, not as a result of breakdown, the symbol "Sim" is used.
8	Remarks. If an EPR was related to the part used, the EPR number is shown in this column. The notation "Failure" indicates parts replaced as a result of a failure.

PARTS ANALYSIS CHART		PROJECT NO. 1-7-2625-34	NOMENCLATURE Recovery Vehicle, Full-Tracked: Light Armored (M113A1). XM806E1	PART 2-B. DATA		IDENTIFICATION NO. C-3914
(SEQUENCE NO.) OF PC.	FEDERAL STOCK NUMBER	NON-NOMENCLATURE	Maintainance Level C - OPERATOR/CREW G - PILOT F - DIRECT H - GENERAL SPEC	PICTURE	DESCRIPTION	REMARKS
0100.2 (13)	2815-022-6752 (1 ea)	Engine Assembly	F	F	1,027.5-M 68.4-H	Unsched
01 (43)	2815-792-9625 (1 ea)	Gasket, Engine Valve Cover	Not Presb	0	611.2-M 37.2-H	Unsched
01 (48)	2815-792-9625 (1 ea)	Gasket, Engine Valve Cover	Not Presb	0	181.8-M 20.3-H	Unsched See EPR No KD-25.
01 (25)	2815-792-9625 (1 ea)	Gasket, Engine Valve Cover	Not Presb	0	729.2-M 31.4-H	Unsched See EPR No KD-17.
0106 (11)	2940-555-6348 (1 ea)	Element, Fluid Pressure	0	0	973.4-M 63.5-H	Sched
0106 (27)	2940-555-6348 (1 ea)	Element, Fluid Pressure	0	0	937.6-M 52.2-H	Sched
0106 (60)	2940-555-6348 (1 ea)	Element, Fluid Pressure	0	0	1,093.5-M 65.1-H	Sched
0106 (78)	5730-737-6357 (1 ea)	Plug, Machine Thread, Magnetic	0	0	3,609.5-M 211.4-H	Unsched
0106.6 (78)	2815-074-1916 (1 ea)	Gasket, Cylinder Block End Plate	F	F	3,609.5-M 211.4-H	Unsched
0106 (11a)	2540-620-7366 (1 ea)	Filter Element, Fluid Pressure	0	0	973.4-M 63.5-H	Sched

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PARTS ANALYSIS CHART		PROJECT NO. 1-7-2625-34	NUMERICAL Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1	IDENTIFICATION NO. C-3914	
SEQUENCE NO. of E.	FEDERAL STOCK NUMBER	ITEM NUMBER NAME	Maintenance Level C - CREW D - DRG F - DIRECT H - GENERAL MACH	FAIR LIFE M - MILES H - HOURS P - POINTS EXPIRE DATE	REMARKS
0106 (11b)	2590-679-9168 (1 ea)	Control Assembly, Push-Pull: (Throttle)	0 0	973.4-M 63.5-H	Unsched
0106 (11c)	6240-266-4940 (1 ea)	Lamp, Incandescent	0 0	973.4-M 63.5-H	Unsched
0106 (11d)	6220-557-8229 (1 ea)	Lens, Headlight	0 0	973.4-M 63.5-H	Unsched
0106 (11e)	2530-690-2682 (1 ea)	Shoe Assembly	0 0	802.8-M 52.9-H	Unsched
3307 (11f)	2540-318-0047 (1 ea)	Pintle, Towing	0 0	973.4-M 63.5-H	Unsched
0106 (27a)	2940-745-7730 (1 ea)	Filter Element, Fluid Pressure	0 0	1,911.0-M 115.7-H	Sched
0106 (27b)	2940-620-7366 (1 ea)	Filter Element, Fluid Pressure	0 0	939.6-M 52.2-H	Sched
0106 (27c)	6240-368-4972 (1 ea)	Lamp Unit, Headlight	0 0	883.5-M 47.3-H	Unsched
0106 (27d)	6240-295-2668 (1 ea)	Lamp, Incandescent	0 0	1,911.0-M 115.7-H	Unsched
0106 (27e)	6240-019-3093 (1 ea)	Lamp, Incandescent	0 0	1,911.0-M 115.7-H	Unsched

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PARTS ANALYSIS CHART		PROJECT NO. 1-7-2625-34	NOMENCLATURE Recovery Vehicle, Full-Tracked: Light Armored (M13A1), XM806E1	IDENTIFICATION NO. C-3914	
SEQUENCE NO. OF NO.	FEDERAL STOCK NUMBER	NOMENCLATURE		Maintainance Level	
				C - OPERATOR/CREW D - DRG F - DIRECT H - GENERAL	FATIGUE LIFE M - MILES H - HOURS E - POINTS
SEQUENCE NO. OF NO.	FEDERAL STOCK NUMBER	ITEM NO. NOMENCLATURE	DESCRIPTION	Maintainance Level	REMARKS
0106 (27f)	4730-050-4208 (1 ea)	Fitting, Lubrication: (Track Tension Adjustment)	0	0	1,911.0-M 115.7-H Unsched
0106 (60a)	2940-745-7730 (1 ea)	Filter Element, Fluid Pressure	0	0	1,093.5-M 65.1-H Sched
0106 (60b)	2940-785-3851 (1 ea)	Filter Element, Fluid Pressure	0	0	3,004.5-M 180.8-H Sched
0106 (60c)	2520-860-7343 (1 ea)	Parts Kit, Oil Filter	0	0	3,004.5-M 180.0-H Sched
0106 (60d)	2520-767-3153 (1 ea)	Filter Element, Fluid Pressure	0	0	3,004.5-M 180.0-H Sched
0309 (70)	4820-849-1226 (1 ea)	Cock Drain, (Fuel) Filter	0	0	3,609.5-M 211.4-H Unsched
0505 (77)	2930-780-5225 (1 set)	Belts, V, Matched Set	0	0	3,609.5-M 211.4-H Unsched
0601.1 (10)	2920-818-8635 (1 ea)	Generator, Engine	0	0	973.4-M 63.5-H Unsched
0602 (9)	2920-900-7993 (1 ea)	Regulator	0	0	973.4-M 63.5-H Unsched
0607 (12)	6240-368-4972 (1 ea)	Lamp Unit, Headlight	0	0	1,018.5-M 67.5-H Unsched

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PARTS ANALYSIS CHART		PROJECT NO. 1-7-2625-34	NOMENCLATURE Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1		IDENTIFICATION NO. C-3914
(SEQUENCE NO.) GF NO.	FEDERAL STOCK NUMBER	NOMENCLATURE	MAINTENANCE LEVEL		
			C - OPERATOR/CREW	G - CRG	F - DIRECT
			H - GENERAL	M - MILES	H - HOURS
			L - ROUNDS	R - ROUNDS	E - SEASONS USED
			L	E	E
0607 (15)	6625-580-3881 (1 ea)	Indicator, Dial (Generator)	Not Presb	0	1,027.5-H 38.4-H
0607 (20)	6240-044-6914 (1 ea)	Lamp, Incandescent	0	0	1,027.3-M 68.4-H
0607 (22)	6240-368-4972 (1 ea)	Lamp Unit, Headlight	0	0	Unsched
0607 (30)	6240-295-2421 (1 ea)	Lamp, Incandescent	0	0	Unsched
0607 (44)	6240-266-4940 (1 ea)	Lamp, Incandescent	0	0	Unsched
0607 (54)	6240-368-4972 (1 ea)	Lamp Unit, Headlight	0	0	9.0-M 0.9-H
0607 (55)	6240-368-4972 (1 ea)	Lamp Unit, Headlight	0	0	Unsched
0607 (67)	6240-368-4972 (1 ea)	Lamp Unit, Headlight	0	0	Unsched
0608.1 (17)	5930-679-9289 (1 ea)	Switch, Miscellaneous (Neutral Start)	0	0	1,027.5-M 68.4-H
0608.1 (21)	5930-692-9288 (1 ea)	Switch, Miscellaneous (Oil Pressure)	0	0	1,027.5-M 63.4-H

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PARTS ANALYSIS CHART		PROJECT NO. 1-7-2625-34	NOMENCLATURE Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1		IDENTIFICATION NO. C-3914
SEQUENCE NO. GF NO.	FEDERAL STOCK NUMBER	NOMENCLATURE		Maintainance Level C - CPEAPTOP / CPEAP G - TEC F - DIRECT H - GENERAL	MAINTAINANCE LEVEL M - MILE H - HOUR E - HOURIC
				PIECE P/N	PIECE P/N
0610 (50)	6680-767-1635 (1 ea)	Transmitter, Liquid Quantity	0	0	2,549.7-M 157.3-H
0820 (79)	5340-679-7998 (1 ea)	Mount, Resilient, Transfer	0	0	3,609.5-M 211.4-H
1008.2 (28)	5330-286-7056 (1 ea)	Seal, Plain Encased	0	0	1,911.0-M 115.7-H
1301.2 (1)	2530-714-6155 (1 ea)	Cover Plate, Access (Road Wheel)	0	0	171.6-M 11.6-H
1301.2 (7)	2530-679-7951 (1 ea)	Seal, Outer Needle Bearing	0	0	331.8-M 20.5-H
1301.2 (35)	5330-996-0717 (1 ea)	Seal, Plain Encased (Idler)	0	0	1,938.5-M 120.1-H
1301.2 (36)	5330-996-0717 (1 ea)	Seal, Plain Encased (Road Wheel Hub)	0	0	1,938.5-M 120.1-H
1301.2 (45)	2530-679-7973 (2 ea)	Wheel, Solid, Rubber Tire	0	0	2,080.1-M 128.3-H
1301 (47)	2530-679-7965 (1 ea)	Torsion Bar, Suspension, Left Front	0	0	2,294.0-M 139.0-H
1301 (57)	2530-679-7965 (1 ea)	Torsion Bar, Suspension, Left Front	0	0	590.5-M 37.8-H

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PARTS ANALYSIS CHART		PROJECT NO. 1-7-2625-34	MISCELLANEOUS Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1	IDENTIFICATION NO. C-3914
SEQUENCE NO.	ITEM NO.	FEDERAL STOCK NUMBER	ITEM NO.	DESCRIPTION
1301.2 (49)	2530-679-7973 (1 ea)	Wheel, Solid Rubber Tire		MATERIAL LEVEL C - OPERATOR/CREW D - DRG F - DIP ECT H - GENERAL
1301 (61)	2530-679-7973 (5 ea)	Wheel, Solid Rubber Tire		MATERIAL LEVEL C - OPERATOR/CREW D - DRG F - DIP ECT H - GENERAL
1301 (71)	5330-679-9879 (1 ea)	Seal, Plain, Encased		MATERIAL LEVEL C - OPERATOR/CREW D - DRG F - DIP ECT H - GENERAL
1301 (75)	2530-679-7973 (1 ea)	Wheel, Solid Rubber Tire		MATERIAL LEVEL C - OPERATOR/CREW D - DRG F - DIP ECT H - GENERAL
1301.2 (76)	2530-715-3864 (1 ea)	Gasket		MATERIAL LEVEL C - OPERATOR/CREW D - DRG F - DIP ECT H - GENERAL
1301 (80)	2530-679-7951 (2 ea)	Seal, Outer		MATERIAL LEVEL C - OPERATOR/CREW D - DRG F - DIP ECT H - GENERAL
1301 (80a)	5330-679-9879 (1 ea)	Seal, Plain Encased		MATERIAL LEVEL C - OPERATOR/CREW D - DRG F - DIP ECT H - GENERAL
1301 (80b)	5330-171-9082 (1 ea)	Seal, Plain, Encased		MATERIAL LEVEL C - OPERATOR/CREW D - DRG F - DIP ECT H - GENERAL
1301 (80c)	2530-996-0719 (2 ea)	Arm Assembly		MATERIAL LEVEL C - OPERATOR/CREW D - DRG F - DIP ECT H - GENERAL
1301 (80d)	2530-959-5878 (1 ea)	Gasket		MATERIAL LEVEL C - OPERATOR/CREW D - DRG F - DIP ECT H - GENERAL

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PARTS ANALYSIS CHART		PROJECT NO. 1-7-2625-34	INNOMCLATURE Recovery Vehicle, Full-Tracked:	Light Armored (M113A1), XM806E1	IDENTIFICATION NO. C-3914	
SEQUENCE NO. OR NO.	INTERNAL STOCK NUMBER			M A I N T E N A N C E   L E V E L C - O P E R A T O R / C H E C K C - T H I C K F - T I F F E T H - G E N E R A L I - F C M	F A T T L I F E M - M I L E S H - H O U R S P - S E R V I C E	
1301 (80e)	2530-773-2138 (1 ea)	Bearing, Sleeve	0	0	3,609.5-M 211.4-H	Unsched
1301 (80f)	2530-715-3864 (1 ea)	Gasket	0	0	3,609.5-M 211.4-H	Unsched
1301 (80g)	5340-695-8793 (1 ea)	Spacer, Sleeve	0	0	3,609.5-M 211.4-H	Unsched
1303 (63)	2530-066-1316 (1 ea)	Adjuster Track, Hydraulic	0	0	3,584.8-M 108.5-H	Unsched
1303 (71)	3110-100-0359 (1 ea)	Cup, Tapered Roller Bearing	0	0	3,609.5-M 211.4-H	Unsched
1303 (71a)	3110-100-0295 (1 ea)	Cup, Tapered Roller Bearing	0	0	3,609.5-M 211.4-H	Unsched
1303 (71b)	2530-714-6153 (1 ea)	Hub, Assembly	0	0	3,609.5-M 211.4-H	Unsched
1303 (71c)	3110-100-0220 (1 ea)	Cone and Rollers	0	0	3,609.5-M 211.4-H	Unsched
1303 (74)	2530-856-2299 (1 ea)	Wheel	0	0	3,609.5-M 211.4-H	Unsched
1304 (51)	2520-679-7956 (4 ea)	Sprocket Wheel	0	0	2,549.7-M 157.3-H	Unsched

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PARTS ANALYSIS CHART		PROJECT NO. 1-7-2625-34	NOMENCLATURE Recovery Vehicle, Full-Tracked: Light Armored (M113A1). X#806E1	IDENTIFICATION NO. C-3914	
(SEQUENCE NO.) GP NO.	FEDERAL STOCK NUMBER	NOUN NOMENCLATURE		Maintainance Level C - OPERATOR/CREW O - OHC P - DIRECT H - GENERAL	Part Life M - MILES H - HOURS R - ROUNDS
				L	E
1304 (52)	2520-679-9657 (1 ea)	Cushion, Rubber Sprocket	0	0	2,549.3-M 157.3-H
1305 (2)	MFR PART NO 10866004-1 (1 ea)	Shoe Assembly	C	0	171.6-M 11.6-H
1305 (31)	MFR PART NO 10866004-1 (1 ea)	Shoe Assembly	C	0	938.3-M 48.2-H
1305 (53)	MFR PART NO 10866004-1 (6 ea)	Shoe Assembly	C	0	2,549.7-M 157.3-H
1305 (58)	MFR PART NO 10866004-1 (34 ea)	Shoe Assembly	C	0	3,004.5-M 180.8-H
1305 (62)	MFR PART NO 10866004-1 (4 ea)	Shoe Assembly	C	0	3,442.8-M 93.5-H
1305 (64)	MFR PART NO 10866004-1 (127 ea)	Shoe Assembly	C	0	3,609.5-M 211.4-H
1604.3 (37)	2530-679-9222 (1 ea)	Bumper, Rubber	0	0	1,938.5-M 120.1-H
1604.1 (81)	2540-714-6156 (1 ea)	Shock Absorber, Direct Action	0	0	3,609.5-M 211.4-H
1803.1 (29)	5340-321-6183 (1 ea)	Hook, Ramp Door	0	0	1,918.9-M 117.9-H

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PARTS ANALYSIS CHART		PROJECT NO. 1-7-2625-34	NOMENCLATURE Recovery Vehicle, Full-Tracked: Light Armored (M113A1). XM886E1	IDENTIFICATION NO. C-3914	
SEQUENCE NO. GF NO.	FEDERAL STOCK NUMBER	NOMENCLATURE		Maintainance Level 1 - OPERATOR / CREW 2 - FGU 3 - PIPERIT H - GENERAL	MAINTAINANCE LEVEL 1 - ECW 2 - ECR
				FATIGUE LIFE M - MILES H - HOURS	FATIGUE LIFE M - MILES H - HOURS
2001 (59)	5340-321-6183 (1 ea)	Hook, Ramp Door	0	0	3,004.5-M 180.8-H
01 (68)	5340-535-6465 (1 ea)	Clamp, Cushioned	0	0	3,609.5-M 211.4-H

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PART 3-A

MAINTENANCE PACKAGE LITERATURE CHART INSTRUCTION SHEET

<u>COLUMN</u>	<u>DESCRIPTION</u>
1	Army or manufacturer's publication or draft manual number.
2	Number of copies received.
3	Complete title
4	Date publication was received.
5	Date test item or material was received.
6 & 7	"X" in appropriate column shown results of evaluation (Minor errors on 1598 forms are not in themselves sufficient reason to term a manuscript inadequate )
8	EPR number and date 1598 form was forwarded.
9	Appropriate remarks

## PART 3-B. DATA

NUMBER	STY	TITLE	DATE RECEIVED			EVALUATION			FORM 159b		
			LIT	MATERIEL	AIRCT	INADQT	DATE FORWARDED	REMARKS			
1	2	3	4	5	6	7	8				9
Unnumbered	10	Supplement to: TM9-2300-224-10/2/1 dated 17 September 1964 with changes 1 through 5 Operator's Manual for Conversion Kit, Recovery: M113A1 19207-11647302 on Carrier, Personnel, Full Tracked: Armored M113A1 (Diesel) 2320-968-6321 November 1968	19 Dec 68 and 2 Jan 68	16 Dec 68	X						
Unnumbered	1	Supplement To: TM9-2300-224-10 dated 7 November 1961 with changes C1, C3, C5, C6, and C9. Operator's Manual for Recovery Vehicle, Full Tracked, Light Armored, XM608 2350-808-6119 April 69	15 May 69	16 Dec 68	X						
Unnumbered	1	Supplement to: TM9-2300-224-10/2/1 dated 17 September 1964 with changes C1 through C6 Operator's Manual for Recovery Vehicle Full Tracked, Light Armored, XM806E1 2350-800-6104 May 1969	29 May 69	16 Dec 68	X						
Unnumbered	2	L09-2300-224-12/2 Supplement Lubrication Order Conversion Kit, Recovery-M113A1, 15 November 1968	19 Dec 68	16 Dec 68							
Unnumbered	2	L09-2300-224-12 Supplement Lubrication Order Recovery Vehicle, Full Tracked, Light Armored, XM806, 15 May 1969	15 May 69	16 Dec 68							

IDENTIFICATION NO  
F-3914

Lubrication order was superceded by 15 June 1969 edition, therefore, evaluation was not completed. See para 2.12.3.2.

Lubrication order was superceded by 15 June 1969 edition, therefore, evaluation was not completed. See para 2.12.3.2.

MANUFACTURE PACKAGE MATERIAL PLAN		PROJECT NO 1-7-2625-34	NOMENCLATURE Recovery Vehicle, Full Tracked: Light Armored (M113A1, XM806E1)	IDENTIFICATION NO C-3914			
NUMBER	QTY	TITLE	DATE RECEIVED	EVALUATION		DATE FORWARDED	REMARKS
				LIT	MATERIEL		
1	2	3	4	5	6	7	8
Unnumbered	1	L09-2300-224-12/2 Supplement Lubrication Order Recovery Vehicle, Full Tracked, Light Armored XM806E1, 15 June 1969	29 May 69	16 Dec 68	X		EPR No KD-1 (Pub) Contains discrepancies that require correction. See para 2.12.3.3.
Unnumbered	10	Supplement to: TM9-2300-224-20/2/1 dated 16 November 1964 with changes C1 through C4 Organizational Maintenance Manual for Conversion Kit, Recovery: M113A1 19207- 11647302 on Carrier Personnel, Full Tracked: Armored: M113A1 (Diesel) 2320-968-6321, November 1968	19 Dec 68 and 2 Jan 69	16 Dec 68	X		
Unnumbered	2	Supplement to: TM9-2300-224-20 dated 15 December 1961 with changes C1, C2, C3, C5, C8, C10, and C11. Organizational Maintenance Manual for Recovery Vehicle, Full Tracked: Light Armored, XM806 2350-808-61, 19 April 1969	15 Mar 69	16 Dec 68			Basic manual superseded by 16 Nov 64 edition, therefore, review was not completed. See para 2.12.3.2.
Unnumbered	1	Supplement to: TM9-2300-224-20/2/1 dated 16 November 1964 with changes C1 through C4 Organizational Maintenance Manual for Recovery Vehicle, Full Tracked: Light Armored, XM806E1 2350-800-6140, May 1969	29 May 69	16 Dec 68	X		
Unnumbered	2	TM9-2300-224-20P/3 Supplement Organiza- tional Maintenance Repair Parts and Special Tools List For Recovery Vehicle, Full Tracked, Light Armored, XM806 2350-807-6119, undated	15 May 69	16 Dec 68			Manual was superseded by an undated edition received on 24 May 69, therefore, evaluation was not completed. See para 2.12.3.2.

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PACKAG			PROJECT NO 1-7-2625-34	NOMENCLATURE Recovery Vehicle, Full Tracked: Light Armored (M113A1), XM806E1			IDENTIFICATION NO L-2814		
NUMBER	STY	MANUSCRIPT	TITLE	DATE RECEIVED			EVALUATION		
				LIT	MATERIAL	ADQT	IMADQT	DATE FORWARDED	REMARKS
1	2	3	4	5	6	7	8	9	
Unnumbered	1	TM9-2300-224-20P/3 Supplement Organizational Maintenance Repair Parts and Special Tools List for Recovery Vehicle, Full Tracked, Light Armored, XM806E1 2350-800-6104, undated	29 May 69	16 Dec 68	X			EPR No KD-2 (Pub)	Contains discrepancies that require correction. See para 2.12.3.3b.
Unnumbered	2	Supplement to: TM9-2300-224-34/3 dated June 1965 with changes C1 through C3 Direct and General Support Maintenance Manual for Recovery Vehicle, Full Tracked, Light Armored, XM806 2350-808-6119, 15 April 1969	15 May 69	16 Dec 68	X				
Unnumbered	1	Supplement to: TM9-2300-224-34/3 dated June 1965 with changes C1 through C3 Direct and General Support Maintenance Manual for Recovery Vehicle, Full Tracked, Light Armored, XM806E1 2350-800-6104, 1 May 1969	29 May 69	16 Dec 68	X				
Unnumbered	2	TM9-2300-224-35P/3 Supplement Direct and General Support and Depot Maintenance Repair Parts and Special Tools List For Recovery Vehicle, Full Tracked, Light Armored, XM806 2350-808-6119, undated	15 May 69	16 Dec 68					Manual was superseded by an undated edition received on 29 May 69, therefore, evaluation was not completed. (See below.) See para 2.12.3.2.
Unnumbered	1	TM9-2300-224-35P/3 Supplement Direct and General Support and Depot Maintenance Repair Parts and Special Tools List For Recovery Vehicle, Full Tracked, Light Armored, XM806E1 2350-800-6104, undated	29 May 69	16 Dec 68	X			EPR No KD-3 (Pub)	Contains a discrepancy that requires correction. See para 2.12.3.3c.

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#### APPENDIX IV. REFERENCES

1. Ltr, AMSTE-BB 1-7-2625-09, 1-7-2625-34, HQ USATECOM, 20 Nov 68, subject: Test Directive, Engineering and Service Tests of Vehicle Recovery Kit and Line for Carrier, Personnel, Full-Tracked, Armored, M113A1, RDT&E Project No 1G564605D410, w 3 incl.
2. Ltr, AMSTE-BB 2625-09, -34, HQ USATECOM, 27 Nov 68, subject: Recovery Vehicle, Full-Tracked: Light Armored (M113A1) XM806E1.
3. USAFRENBD Plan of Service Test of Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1, USATECOM Project No 1-7-2625-34, 31 Dec 68.
4. Ltr, AMSTE-BB 2625-34, HQ USATECOM, 6 Mar 69, subject: Interim Safety Release for Recovery Vehicle, Full-Tracked Light Armored (M113A1) XM806E1, USATECOM Project No. 1-7-2625-34.

**UNCLASSIFIED**

Security Classification

**DOCUMENT CONTROL DATA - R & D**

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

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4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Final Report, 16 December 1968 - 16 June 1969		
5. AUTHOR(S) D. G. Barneby James L. Neumann, Scientific and Engineering		
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16. ABSTRACT The test objective was to determine if the test item is suitable for US Army use. Testing was conducted on one test item for a total of 4,001.2 miles and 100 hours of winch operation and 12 hours of crane operation. Testing was under actual field conditions on missions which typify normal operational use of the equipment by troops in the field. The maintenance ratio for the test item was 0.0815 hour of active maintenance time per mile of vehicle operation. Deficiencies occurred when the winch hydraulic system pickup hose rubbed against the cooling fan drive belt and the engine oil pan cracked on both the original and replacement engines. Based on 4,001.2 miles of operation and 17 equipment failures, the MTBF was 235.3 miles. The total active maintenance time to repair failures was 133.2 man-hours and 46.5 clock-hours giving a MTTR of 7.78 man-hours and 2.73 clock-hours. It was concluded that the Recovery Vehicle, Full-Tracked: Light Armored (M113A1), XM806E1 is unsuitable for US Army use pending correction of the winch hydraulic system pickup hose deficiency. USAARENBD recommended that the cited deficiency be corrected, the engine oil pan deficiency be investigated, and as many as feasible of the shortcomings listed in appendix II be corrected.		

**DD FORM 1473** REPLACES DD FORM 1473, 1 JAN 68, WHICH IS  
SUBLETS FOR ARMY USE.

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**400 814**

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Security Classification

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Winch Auxiliary Crane Recovery Vehicle, Full-Tracked: Light Armored M One One Three A One XM Eight Zero Six E One Recovery Kit						

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